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VETERINARY MEDICINE

JANUARY 1939

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VOL. XXXIV
No. 1

Entered as second-class matter Nov. 8, 1920, at the post office at Chicago, Ill., under the Act of March 3, 1879.

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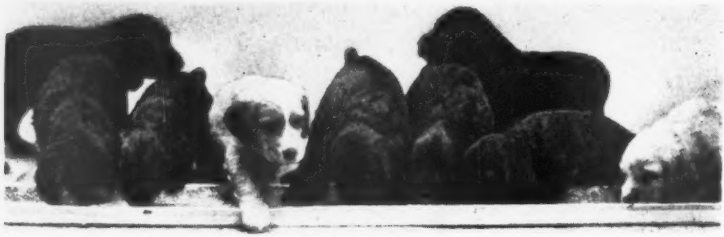

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VOL. XXXIV JANUARY, 1939 No. 1

Published Monthly by the

VETERINARY MAGAZINE CORPORATION

7632 S. CRANDON AVE., CHICAGO, ILL., U. S. A.

$4.00 a year: per copy 50 cents: Special Issues $1.00

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Smallpox is reported to be an extinct disease in Poland as a result of strict law enforcement on vaccination and revaccination.—*S. N. L.* 34:21.

* * * *

A number of the state agricultural colleges and experiment stations coöperated in arranging a veterinary exhibit at the World's Columbian Exposition (Chicago, 1893). Prof. W. L. Williams and later Prof. E. A. A. Grange was in charge of assembling the veterinary exhibit, which consisted, in part, of anatomical and pathological specimens and drawings.

* * * *

Bovine anaplasmosis has not been prevalent during the past two years. So far as is known all cattle that have had an attack of anaplasmosis harbor the infection for an indefinite period. Calves can be immunized by the use of infected blood but when so treated they become a source of infestation for other cattle. Various skin parasites, ticks, etc., are the usual means of transmitting the anaplasma. Arsenical preparations have value as curative agents, according to some practitioners and investigators. Mercurochrome is also claimed to have curative properties. No agent has been found that will destroy the anaplasma in living blood.

Hogs vaccinated by the serum simultaneous method, do not communicate disease to others unless they themselves become sick.—*B. A. I. Bulletin No. 102.*

* * * *

In 1890, the population of the United States was 62,947,714. In 1938 it was approximately 130,000,000. The number of beef cattle in the United States in 1890 was approximately 45 million. In 1938 it was 42 million. In other words, the population has more than doubled in the last 48 years and the number of beef cattle has decreased 7%. There has been a marked improvement in the quality of beef cattle during the last 50 years and at the same time a large decrease in the per capita consumption of beef.

* * * *

Some disorders in farm animals have their origin in improper feeding of cottonseed products. Young calves should not be fed much, if any, such products. Only small quantities should be fed to horses, mules and swine. The feeding should not continue for a period longer than 100 to 120 days. Cottonseed products are valuable part of the ration for fattening cattle when supplemented with other feeds because they contain valuable protein constituents and they also stimulate the appetite.

Merillat Executive Secretary of the A.V.M.A.

L. A. Merillat, Chicago, secretary of the A.V.M.A. 1916-17, president 1924-25, and executive board member 1928 to date, was elected executive secretary at the annual meeting of the Executive Board in Chicago, Nov. 29, 1938.

L. A. Merillat

The new chief of the headquarters office of the A.V.M.A. brings to his duties an experience of more than 50 years in the veterinary profession, including conduct of one of the very large practices in the United States, many years as a teacher in two large veterinary colleges, a prolific author, a veterinary editor, a veterinary historian, an executive in a veterinary commercial enterprise, and an extremely active service in the A.V.M.A., the Illinois and the Chicago veterinary associations, for more than two score years. One of the most popular speakers on state and local veterinary programs in a dozen midwest states, not more than two or three veterinarians have attended more meetings than he. As chief veterinarian of the First Army during the World War he directed the work of veterinarians responsible for the well-being of more than 96,000 horses. Other biographic data may be found in the April, 1938, issue of this magazine (p. 152-155). If thorough preparation for one's duties assures proficiency, the A.V.M.A. has a prosperous future in prospect.

* * * *

Research and demonstration areas totaling approximately 6,018,560 acres are now utilized by the coöperative wildlife research, demonstration and management program of The American Wildlife Institute, Bureau of Biological Survey, land-grant colleges, and state conservation commissions. There are also millions of acres in farm-game management areas which are definitely tied up with this program.

When prontosil is administered by mouth or by injection, a considerable amount of sulfanilamide is excreted. It is considered quite possible that the therapeutic action of prontosil is due to the sulfanilamide derived from it by reduction in the body.—*Lancet*, 1937.

* * * *

Governmental Regulation of Medicine

The medical profession is excited over the prospect of falling under the command of the government. Says *Hygeia* and the *Journal of the American Medical Association*, "There can be but one master of the house of medicine and that is the physician." These and practically all other spokesmen of the medical profession go on to explain that only persons qualified by training and experience are entitled to chart the course of the "house of medicine" and plan the treatment of the sick.

To all of this the veterinary profession is in wholehearted accord, for it is interested in the same objective. It has the problems of the present and the problems of the future to solve and no one could argue with reason that a good knowledge of medicine is not required of the commanders chosen to solve them.

But, can medicine afford the independence it seems to advocate? The medical and veterinary professions would be the first to howl if shorn of governmental regulations and left to do as they please. No professions have begged for laws and regulations more than these two and none has obtained more from the lawmakers than the medical profession which, needless to add, could not survive without the governmental regulation that keeps it from being overwhelmed by quackery and dubious conduct. Better that these two professions invite the government to do more regulating than to keep hands off in the name of liberty and independence, since medicine above all professions needs regulating.

The B.A.I., together with its state affiliates, and their accredited veterinarians, is a government-regulated force. What would our country be without it? And, what could be a logical substitute?

A gas-proof chamber for dogs and other small animals has been devised as result of British pet owners' concern for their animals in event of air raid.—*S. N. L.* 34:20.

* * * *

Writing for Publication

Needs of the worker in a specialized field for proper organization of his material and an approved writing style to meet the requirements of trade and technical publications are answered in a home-study course, "Composition of Technical Papers," offered by the Extension Division of the University of Wisconsin, Madison. The course is given as a helpful means of acquiring excellence in writing under guidance, without interruption to the daily occupation, and is available to individuals in any state.

In making this opportunity better known, the Extension Division points to the need of many persons in specialized fields for greater proficiency in writing articles for publication, as well as business letters and reports. In the assignments the student is introduced to an effective professional style, to the planning and arrangement of technical papers, to the important points in paragraphing, punctuation, capitalization, abbreviation, proofreading, and other phases of efficient writing in his field. The instruction is personal through the exchange of helpful comment, criticism, and suggestions.

The Wisconsin course provides practice in writing expositions on topics arising in the student's own line of work, so that the training he receives becomes immediately applicable to the needs of his occupation.

* * * *

Unfortunate—If True

Strangely the public is becoming "hardened" to rabies scares in the newspapers and is accepting rabies as something which is no longer news.—*Will Judy,* Chicago.

The same issue of the *Dog World,* in which the foregoing occurs, contains the statement that, in the first ten months of 1938, Pasteur treatments were furnished free to 1313 persons in Chicago.

Professor and Mrs. Wm. Mitchell, Edinburgh, Scotland, on their return from a mountain climbing expedition. The photograph was taken at Interlaken, Switzerland, during the XIII International Veterinary Congress. Professor Mitchell is head of the department of surgery of the Royal (Dick) Veterinary College.

Veterinary Vital Statistics 44 Years Ago

The sixth annual meeting of the Iowa Veterinary Medical Association held in Des Moines, December 12, 1893, received a report from a committee for the collection of veterinary vital statistics. The committee reported the number of cases of disease and unsoundness in horses that had been reported to it during the year. It complained that it had received very little encouragement from members of the association, comparatively few having filled out and returned the blanks supplied them by the committee. An effort was made to relate unsoundness of various types including periodic ophthalmia to heredity.

U. S. Live Stock Sanitary Ass'n

THE 42nd annual meeting of the United States Live Stock Sanitary Association, like all meetings of this association since 1908, was held in Chicago. The meeting convened November 30, 1938, with President Westmoreland of Kentucky in the chair, and continued three days. The attendance although good was not quite equal to the average of recent meetings. For the first time all 48 states held executive memberships in the association. J. L. Axby, state veterinarian of Indiana, was elected president of the organization for the ensuing year; H. D. Port and I. McAdory, state veterinarians of Wyoming and Alabama, respectively, first and second vice president. L. Enos Day, Chicago, was reëmployed secretary-treasurer.

Although the U. S. L. S. S. A. is strictly a regulatory officials' association, much of the program at its meetings, as a rule, deals with problems of veterinary research. This meeting was no exception. Without discounting the value of such discussions to regulatory bodies, it seems that devoting a half day largely to proof that Bang's disease can be eradicated from herds and counties by the test and slaughter method was a waste of time. If there is any live stock regulatory official or other veterinarian that does not know that by this time he is not likely to learn it at all. Even the comparative merits of the tube and plate test, another question already settled, came in for discussion. The unsettled questions with regard to Bang's disease eradication are the economic aspects of the test and slaughter methods and the place of vaccination. These, the real questions, received little attention, to the general disappointment.

A pleasant interruption of the program occurred on the second day of the meeting when the chairman called to the platform Dr. Geo. W. Gillie* of Fort Wayne, Ind., and introduced him as congressman-elect. Doctor Gillie, in a brief speech, expressed the hope that his services in the Congress would reflect credit upon his constituents and honor upon the veterinary profession.

Among the resolutions adopted by the gathering were recommendations:

1. That the tuberculin test be not required for interstate shipment of feeder, beef cattle from modified accredited counties, (2) that the same regulations apply for the interstate shipment of sheep from all sources

George W. Gillie

within like territory, (3) opposition to the proposed Argentine trade treaty, (4) collection and publication of animal disease statistics and (5) compiling of model uniform laws and regulations governing the interstate movement of live stock.

*GEORGE W. GILLIE, Republican, of Fort Wayne, Indiana, born in Berwickshire, Scotland, August 15, 1880; moved to the United States with his parents, who settled in Kankakee, Illinois, in 1882, and in Allen County, Fort Wayne, Indiana, in 1884; attended public schools and the International Business College; in 1901 completed a short course in dairy science and industry at Purdue University; was graduated from Ohio State University in 1907 with degree of Doctor of Veterinary Medicine; meat and dairy inspector of Allen County, 1908-14; began practice of veterinary medicine in 1914; Sheriff of Allen County, 1917-20, 1929-30 and 1935-37; in 1920 was the unsuccessful Republican candidate for Mayor of Fort Wayne; holds a commission of captain in the Reserve Officers' Corps; member of Congregational Church, Kiwanis Club, the Scottish Rite, Mizpah Shrine, Loyal Order of Moose, Odd Fellows, Modern Woodmen of the World, Y. M. C. A., American Veterinary Medical Association, Indiana State Veterinary Association, the United States Livestock Sanitary Association, and Disaster Committee of the Fort Wayne Division of the American National Red Cross; married and has two grown daughters; elected to the Seventy-Sixth Congress November 8, 1938, from the 4th district of Indiana by the largest plurality of any congressional candidate in the state, carrying every county in his district, normally Democratic.

Abstracts of the more important papers of general interest to veterinarians follow:

Phases of Meat Inspection*

Doctor Koen's paper was essentially an argument and a plea for the establishment of a system of meat inspection, equivalent to that of the Federal Bureau of Animal Industry, for the one-third of the meat and meat products consumed in the United States which, at present, is subjected to inadequate inspection or, in the majority of cases, no inspection at all. Taking the unassailable stand that the public is entitled to wholesome meat and meat products and that it is the duty of government, federal or state, to assure products of this quality, the speaker unquestionably indicted most of his hearers for their failure in the past to safeguard the public by preventing diseased and unwholesome meat from entering the channels of trade, but he did it in a manner to make all feel they were being encouraged to do a better job in the future, rather than being censured for neglect of duty in the past.

He extolled the federal meat inspection service as probably the best in the world, but regretted that it covered only two-thirds of the meat supply in this country and probably not that portion of the meat supply which most needs inspection. Nevertheless, 308,000 of the 75,000,000 carcasses coming under federal inspection annually are condemned. Thus assuming that the meat that is not inspected is no worse than the inspected meat, 160,000 carcasses should be condemned annually in the uninspected trade. There is no record of the rejection of any such number of carcasses. In fact, it is known that comparatively few in this trade are condemned or rejected for any cause.

Doctor Koen's plea for the extension of meat inspection service to include all meat and meat products that go into the channels of trade was not based alone upon the public health benefits of such procedure. He stressed the fundamental importance to disease control of the information as to the whereabouts and extent of animal disease that is derived from an inspection service. He pointed out that at present in a vast number of cases, the first report of the occurrence of animal disease in a given locality, that comes to the live stock sanitary authority of the state, is a report of the federal meat inspector at the point where the animals are slaughtered; and that if all slaughtering were done under an equally alert inspection service, that few locations in which animals were seriously diseased or parasitized would long escape the knowledge of the state's live stock sanitary service, and that such information would be of tremendous value in combating animal disease.

He reminded his audience that: "Our nation cannot exist without live stock. Live stock cannot thrive and return profits to the owners if menaced by animal diseases and parasites. Animal diseases and parasites cannot be controlled and eradicated without an army of competent veterinarians." In short, that animal husbandry is essential to agriculture, that there is no profit in a sick animal and that animal disease control is a complex problem requiring the services of experts.

Having served for many years in the Federal meat inspection service in positions from "tagger" to plant supervisor, and subsequently having organized and directed a municipal meat inspection service, Doctor Koen is in a position to speak authoritatively of the requirements of a meat inspection service. Speaking of the qualifications required of a meat inspector, the speaker stated that he must first of all be a competent veterinarian and pathologist in order to evaluate diseased carcasses and must have sufficient knowledge of bacteriology to understand the action and effects of disease-producing organisms; sufficient chemical information to know what products and conditions are harmful to meat and meat products. He must know something of sanitary engineering, construction engineering and of every craft in the build-

* Abstract of a discussion by John S. Koen, Storm Lake, Iowa, Bureau of Animal Industry, U. S. Dept. of Agric.

ing trade. He must have some knowledge of the work of the architect, of the draftsman, cement worker, steel worker, glazier, brick layer, electrician, plumber, plasterer and painter. He must understand mechanics and refrigeration. He must have a knowledge equal in all respects to that of the foreman in every department of the modern packing and processing plant, from the killing floor, through the cutting room, cooling room, sausage, lard, oil and tankage rooms. He must know the work of every employee in so far as it may affect the sanitary handling of the product. He must be able to cope with superintendents and consult with them concerning problems small and great, problems that sometimes involve hundreds of thousands of dollars in rebuilding and equipment programs. He must be able to uphold the needs of the service and protect the interests of the public at all times. He must needs be considerable of a detective and be ever on the alert. He must recognize the products he inspects as the property of another, of considerable value, yet must not be influenced in passing judgment upon it; his sole consideration being its fitness for human food. He must be an economist, securing at all times the maximum service at minimum cost. In addition, in inspecting products for export, he must know the regulations of every port. And throughout all his work, he must never get away from the fundamental requirements of a veterinary inspector. All this requires training, experience, skill and integrity.

The speaker reminded his hearers that for more than 40 years the federal meat inspection has been and still is essentially a veterinary service. "All key positions" in the Bureau of Animal Industry, "except some filled by scientists engaged in laboratory research, are filled by veterinarians." On the record that the federal meat inspection service has made and the example that it holds forth, he based his plea for making state and municipal meat inspection service similarly a veterinary service, instead of a lay-political service such as has been the tendency in some cities in the past.

Tuberculosis in Poultry and Swine*

There is 70 million dollars worth of poultry on 206,657 Iowa farms. On a majority of these farms the poultry flocks are unprofitable, due to neglect, insanitation and disease. Flocks which are free from tuberculosis and where good sanitation prevails produce top-grade products and are profitable. The low-grade products from the tuberculous flocks on insanitary farms are not only unprofitable to their owners, but injure the producers of high-grade products by repelling customers and decreasing the consumption of poultry. It is a common thing for veterinary practitioners in Iowa to answer telephone calls from anxious housewives as to the significance of unsightly conditions they have found in the carcasses of chickens being prepared for the family dinner table.

"This situation represents the common problem of both those interested in poultry as a business enterprise (either producer, processor, or hatcheryman) and those interested more particularly in disease control work as sanitarians. The production of a higher percentage of top-grade poultry can not be expected, nor can the antipathy of the consumer be dispelled, until the tuberculous poultry flock is eliminated from the picture."

In addition to the loss among flocks from tuberculosis, which is the most important disease of adult birds in Iowa, the spread of this disease to swine is responsible for the infection of 16% of the swine marketed in Iowa, and results in a heavy loss of pork products. It results in a further loss by causing reactions to the tuberculin test in healthy cattle. The loss from this source cannot be computed at present, but according to Feldman and Plum, such reactions are a confusing factor, interfering with the completion of the eradication of tuberculosis from cattle by causing reactions in sensitized but non-infected animals, thus entailing unnecessary slaughter and unnecessary delay in accreditation.

* Abstract of a discussion by J. A. Barger, Des Moines, Iowa, Inspector in Charge, Bureau of Animal Industry, U. S. Dept. of Agric.

Some attempts at area eradication of tuberculosis from poultry have shown that 60% of the flock owners are fully coöperative, 20% are complaisant but indifferent, and 20% are antagonistic in varying degrees. Voluntary eradication cannot be accomplished under a handicap of such magnitude. A state-wide veterinary inspection of poultry slaughtered for sale would solve the problem of shutting off the market for inferior grades. Coöperation of the poultry processors would help greatly, by limiting the opportunity for sale of the output of diseased flocks. At the present time, some processors place their brand name on top-grade products from healthy flocks, but market also low-grade products without a brand.

The problem is being attacked by an educational program sponsored by an organization known as the "Iowa Poultry Disease Control and Sanitation Committee," which comprises representatives of the state and federal regulatory officials, the state extension service, county agents, live stock exchanges, the Institute of American Poultry Industries, and the Iowa Swine Growers' Association. This committee forms county poultry committees which sponsor free poultry clinics to which flock owners may bring birds that have died recently and those sick or unthrifty, see the effects of disease, and learn to what extent sanitary measures and flock management may be expected to correct the conditions. These clinics are held by veterinarians and participated in by as many of the local practitioners as can be interested. The educational value of these demonstrations is very great. While held primarily for flock owners they are attended by hatcherymen, produce buyers, teachers, members of women's clubs, members of civic clubs, and other consumers in considerable numbers, all of whom disseminate the information given out.

Another part of the program is the holding of public meetings for which speakers, qualified to discuss diseases and parasites of poultry, are furnished. The interest aroused by these meetings and the good accomplished is beyond calculation.

A Review of the 1938 Outbreak of Infectious Equine Encephalomyelitis in the United States*

The B. A. I. has a record of 23,000 cases of infectious equine encephalomyelitis occurring in 1935; 4,000 cases in 1936; 170,000 in 1937; and to date 79,606 in 1938. In the first three years the mortality was 25%; in 1938 it was 21%. Only eastern type virus has been found in nine Atlantic seaboard states, only western type west of the Appalachian and Blue Ridge mountains. The mortality of the eastern type of the disease is very high, of the western type relatively low.

In addition to the outbreaks of this disease in this country simultaneous epizoötics of it have occurred in three Canadian provinces, several South American countries, Russia, Japan, and India. Viruses identical with both the eastern strain and the western strain were isolated from persons.

The immunizing properties of the new chick embryo vaccine [VETERINARY MEDICINE, 33:9, p. 408] are far superior to those of the old brain tissue vaccine. More than half a million animals were given the former and 16,342 the latter vaccine during 1938. When combined with results in controlled experiments, the field reports lend ample support to preventive vaccination. It is believed, however, that even so promising a product as this should not be unduly promoted. There are limitations which preclude outlining a practical system of application for all farms. These are matters for individual decision by local livestock sanitary officials, the attending veterinarian, and the owner, after frank discussion of the entire matter. It has been suggested that public health authorities may require vaccination in some states where human encephalitis due to the equine virus became a problem in 1938.

Other control measures still appear desirable—insect control by every practical means, stabling, good husbandry, and sanitary precautions.

*Abstract of a discussion by M. S. Shahan, L. T. Giltner, and H. W. Schoening, Washington, D. C., Pathological Division, Bureau of Animal Industry.

Wheat Germ Oil in the Control of Fowl Paralysis and Kindred Diseases*

Fowl paralysis has come to be recognized, during recent years, as one of the principal causes of adult poultry mortality. Unlike infectious diseases in the ordinary sense, little success has been attained in the control of fowl paralysis. Orthodox sanitary measures on the order of quarantine and slaughter plans have not given the desired results. Long-time control programs by selective breeding of old stock—while successful in some instances—have met with considerable practical difficulties. With this situation as a background, the recent announcement by Butler and Warren as to the preventive and curative effect of wheat germ oil in fowl leucosis has given rise to widespread hope and speculation. Time has not been sufficient to obtain conclusive data on the efficacy of the treatment, notwithstanding over-enthusiastic advertising on the part of some commercial companies.

Up until recently vitamin E was not available in pure form so that most of the studies have dealt with the preventive effect of natural vitamin E concentrates of which wheat germ oil is the outstanding representative. In addition to the antisterility factor, wheat germ oil has been credited with containing a growth-promoting factor for young rats, and a factor necessary for the central nervous system of adult rats. Vitamin E deficiency has also been considered a factor in the muscular dystrophy of herbivora, guinea pigs, rabbits, and adult rats, and in the post-natal paralysis of young rats which develops when the mother's intake of the vitamin is restricted.

In young birds, E deficient simplified diets bring about pathologic syndromes which seem to affect different tissues in various species. Ducklings react in a similar manner as young rats by developing a dystrophy of the skeletal muscles; chicks show severe cerebellar edema and hemorrhages known as nutritional encephalomalacia, the counterpart of "crazy chick disease" in the field; and young turkeys develop a degenerative myopathy of the (involuntary) gizzard muscle. The diets used are known to be low in vitamin E, and vegetable oils and concentrates known to contain vitamin E have a protective action in these diseases. Further experiments, however, are necessary to establish these diseases as manifestations of vitamin E deficiencies.

A summary comparison of the pathology of leucotic diseases and vitamin E deficiencies indicates that leucotic diseases are characterized by autonomous proliferation of hematopoietic elements, while E deficiencies, like other avitaminoses, are primarily characterized by degenerative processes of selected tissues. Thus, there is no known pathologic basis for assuming a specific antileucotic property in wheat germ oil.

As a result of a carefully conducted experiment the author concluded:

"The existence of a specific antileucotic effect of wheat germ oil cannot be considered established from field observations. In the present state of our knowledge there is likewise no justification for making the hypothetical antileucotic effect of wheat germ oil the basis of sales campaigns.

"In therapeutic experiments, involving 60 birds it was observed that wheat germ oil injected intramuscularly is not properly resorbed, and is, therefore, contraindicated from a practical standpoint. Two critical methods were evolved: (a) exploratory operation and biopsy of sites which frequently show gross lesions; (b) the use of pairs of birds similar in constitution and *matched* according to clinical symptoms, one member of which serves as control. Intensive treatment of 24 young birds shown at autopsy to be affected with fowl paralysis, over periods ranging from 10 to 39 days, did not indicate any beneficial effect on the course of the disease. The dosage administered to individual birds was almost as large as that recommended for the preventive treatment of a ton of feed. Similar unsuccessful results have been reported from Great Britain and this country."

*Abstract of a discussion by Erwin Jungherr, Storrs, Connecticut, Department of Animal Diseases, Storrs Agricultural Experiment Station.

Brucella Infection in Swine*

As compared with its prevalence in cattle, a survey of the literature indicates that brucellosis is less common in swine.

While the *Brucella suis* is communicable from swine to other animals, it is dependent for perpetuation upon its natural host —swine, just as the *Brucella abortus* is dependent upon cattle, and the *Brucella melitensis* on goats and perhaps sheep. All three of these types of Brucella are communicable to a wide variety of animals; but spread from animals other than the natural hosts is rare in all three types.

Br. abortus is but slightly pathogenic for swine and infection, if it occurs, is usually without clinical symptoms. *Br. melitensis* is somewhat more pathogenic to swine, but does not produce serious infection.

Swine are readily infected by the *Br. suis*. The infection runs an extremely varied course of a few weeks to several months; but when localized in certain tissues, as bones or testicles, the infection may persist for years.

Some swine become carriers of *Br. suis*, showing no clinical symptoms of the disease; others are but mildly infected, and in still others, abortion occurs. However, the delivery of dead pigs at full term (usually only part of the litter) is believed to constitute a greater loss than does abortion before term. In one survey, *Br. suis* was found responsible for 16% of the pyometra in swine. The disease in swine may assume an acute form in which there is stiffness, lameness, elevation of temperature, inappetence and rapid loss in weight. It may localize in the testicles, causing sterility, or in other organs, resulting in arthritis, bursitis, osteitis, osteomyelitis, etc., in swine of practically all ages. Aged hogs, however, are apt to be more severely affected than young animals.

The agglutination test may be employed to eradicate Brucella infection from individual herds. The procedure employed for the control of infection in cattle can be used, almost without change, for swine. The infected individual is the main source of danger. Contamination persists but a short time in water and soil.

The *Br. suis* is more pathogenic for man than the *Br. abortus*, and brucellosis of swine has an important public health aspect. Nearly two-thirds of the organisms isolated from man in Minnesota and Iowa have been of the suis strain.

Because Brucella infection of swine is an insidious disease with many occult carriers, it is impossible to estimate the damage it does. More research work is needed on methods of control and eradication.

* Abstract of a discussion by S. H. McNutt, Ames, Iowa, Veterinary Research Institute, Iowa State College.

Biological Effect of Weather*

Hippocrates, the world's first scientific physician, the first human ecologist, the first meteorologist, wrote the following:

> The nature of this is best shown by the cattle that are attacked by this disease, especially by goats which are the most common victims. If you cut open the head you will find the brain moist, very full of dropsy and of an evil odor whereby you may learn that this is not a God but a disease which injures the body. So it is also with a man.—The Sacred Disease, Paragraph 14.

Among the many observations made by Hippocrates there are: (1) that man and animals are differentiated by their environment and particularly by the atmospheric conditions under which they live, (2) that the early stages of the development of the embryo may be influenced by the environment of the time and (3) that all disease is fundamentally associated with oxidative changes in the tissues.

It is shown by observation on patients at the Research and Educational Hospital that the passage of different air masses is distinctly associated with change in the blood pressure of the patients. The passage of each cold air mass is associated with an increase in blood pressure and with this a definite degree of anoxia occurs, during which time tissue metabolism is impaired, with resulting production of capillary active (stimulating) substances. With this the tissues are stimulated and the blood pressure falls. If the fluctuation is sufficiently great some patients are apt to faint

*Abstract of a discussion by Prof. William F. Petersen, Chicago, Ill., Department of Pathology, College of Medicine, University of Illinois.

when the blood pressure falls to an unusually low level.

The speaker illustrated by means of charts relation of deaths in the population at large to the change in the barometric pressure. Then it was shown that if one takes different age groups, this susceptibility is least for the normal adult and is distinctly greater for the very young and the very old.

In view of the fact that the vasomotor changes are most pronounced in the skin, and since the autonomic control of the skin vessels is closely associated with the autonomic control of the vessels of the brain and the pelvis, the possibility is projected that environmental effects may readily find their reflection in changing vascularization of the ovary and uterus. This will mean that the ovum as well as the young embryo may be subjected to wide swings in oxygenation, with resulting influences either in the way of depression or stimulation or actual damage.

The conception periods of unusual individuals reveal seasonal differences, with a distinct preponderance of the conception of people of genius or unusual ability, of the insane and criminal insane, of criminals, and feeble minded during periods of greater environmental disturbance (winter-spring).

Attention was called to the important work of Duerst, the celebrated physiologist of the Veterinary Faculty of the University of Bern in Switzerland. Duerst and his associates have shown that differences in the habitus of domestic animals is to be associated with differences in the oxidative potential and that the thyroid gland first gives objective evidence of oxygen deficiency such as that which becomes apparent in higher altitudes. They found that this oxygen deficiency might be reflected both in hair growth and in the pigmentation of the skin. Proceeding a step farther, Duerst and associates found that the constitutional habitus of the domestic animal can be changed either toward slenderness or broadness by placing animals on a diet containing opposite types of salts—potassium, calcium—corresponding in this way to the observations of Katase, who found similar effects when placing new born rabbits on either an alkaline or an acid diet. Proceeding in the same direction, Duerst found that he was able to change the sex ratio of domestic animals with the production of more males when an interference was brought about in the metabolic condition of the maternal organism at certain critical times.

In other words it would seem evident that the fundamental integration between environment and the physiological condition of the human holds true for the domestic animals. While on the one hand the effect of the environment may be more pronounced in the human because of the hairless skin, the human animal manages in most instances to modify the environment and in this way protect himself against undue swings.

* * * *

Accomplishments in the Federal-State Bang's Disease Project*

A report of "Accomplishments in the Federal-State Bang's Disease Project" was made by Dr. A. E. Wight, Chief of Tuberculosis Eradication Division of the Federal Bureau of Animal Industry. According to Doctor Wight there was a considerable increase in the number of herds and cattle placed under supervision in the project during the past year, and figures were given to show an increase of approximately 43% in the number of herds and 22% in the number of cattle as compared with the number one year ago. On November 1, 1938, 18% of the breeding cattle in the United States over six months of age were under supervision in this project.

During the fiscal year ended June 30, 1938, agglutination blood tests were applied to 7,800,000 cattle, of which approximately 4% were found to be reactors. Many of these tests were retests. During that period the owners of reacting cattle received an average federal payment of $26.69, together with an average salvage of $32.07. In states

* Abstract of a discussion by A. E. Wight, Washington, D. C., Chief, Tuberculosis Eradication Division, Bureau of Animal Industry, U. S. Dept. of Agric.

where the owner received a state payment, the average from that source was $20.85. The average appraisal of reacting cattle was $80.37. About 9% of the reactors were registered, purebred cattle.

In 24 states, county-wide testing under the area plan has been or now is in progress in a total of 339 counties. One complete test of all dairy and breeding cattle over six months of age has been made in 255 of these counties.

Doctor Wight reported that further studies were being made in connection with the vaccination of cattle to prevent Bang's disease, but indicated that such vaccination should be confined to calves not less than four or more than eight months of age. Field experiments in this connection have been continued, but thus far the work has not progressed to a point where definite conclusions can be drawn.

The speaker called attention to the fact that the federal law, under which Bang's disease work is now conducted, provides that the owners of reacting cattle shall not receive from the federal government more than one-third of the difference between the appraised value of the animal and the salvage. The law further provides that for cattle slaughtered on or after May 1, 1939, the federal payment shall not exceed the amount paid by the coöperating agencies. This is a most important feature, as nearly all the state legislatures convene within the next few months, and attention will be given the subject of providing state funds for indemnity in Bang's disease work.

* * * *

The Progress and Status of Cooperative Tuberculosis Eradication Work*

During the period from December 1, 1937 to November 1, 1938, 31 counties were added to the list of modified accredited areas in the United States. Twenty-seven municipalities in Puerto Rico were, likewise, placed in that status. Since November 1, 1937, one state, South Dakota, was added to the list of those classed as modified accredited areas, leaving only California in the non-modified area. In the 14 counties in that state not in the modified accredited area, the work is now progressing, with a few exceptions, in a very satisfactory manner.

Public interest has continued in the tuberculosis eradication work. During the fiscal year ended June 30, 1938, tuberculin tests were applied to approximately 14,100,000 cattle, located in about 1,000,000 herds. Approximately 89,000, or 0.6%, reactors were

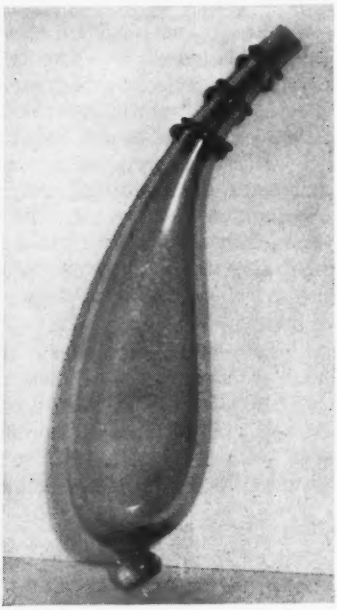
* Abstract of a discussion by A. E. Wight, Washington, D. C., Chief, Tuberculosis Eradication Division, Bureau of Animal Industry, U. S. Dept. of Agric.

Nineteenth Annual Veterinary Conference, University of Illinois. On the left is shown Dr. C. A. Brandly explaining immunity to the assembly. On the right, a group of those in attendance. The total attendance at the Conference, which lasted three days, Oct. 5-7, 1938, was 195.

located. Of these 89,000 reactors, nearly one-half were in the State of California, where much initial testing was conducted.

While particular emphasis has been placed on the eradication of tuberculosis from cattle, a considerable amount of attention has also been given the problem of avian tuberculosis. This disease affects poultry and swine, and is the cause of considerable loss each year. During the past fiscal year approximately 9,000 flocks, located in 10 states, were observed by veterinarians assigned to that project and, as a result of these inspections, the presence of infection was determined on approximately 1,600 farms. Veterinarians engaged in the tuberculin testing of cattle continue to observe poultry flocks in states where it is deemed advisable to do so, and, during the past fiscal year they observed approximately 128,000 flocks, in 6,000 of which infection was reported.

In connection with tuberculosis in hogs, the Federal meat inspection records for the past fiscal year disclose that 9.1% showed some evidence of tuberculosis. This is a slight decrease in comparison with the previous year. Reports from the packing houses are very helpful in locating centers of infection of tuberculosis when the disease is found on post-mortem examination of cattle or hogs.



CAN YOU NAME IT?

The flask shown in the illustration was found by an associate of G. W. Rawson, Detroit, while searching through a trunk in an abandoned room in a farm house over 100 years old, about 18 miles out of Pittsburgh, Pa. Since it was packed with other veterinary equipment, it is presumed that it may have been used for veterinary purposes. The bottle is of greenish glass and measures 12½ inches in length. On two sides it is somewhat flattened, like a baby's milk bottle, and the narrow neck is banded by three brass rings or flanges. The diameter of the opening in the neck is about one-quarter inch. The capacity of the flask is about 18 ounces. The discoverer of the odd container is interested in ascertaining its purpose, and hopes that some "old-timer" in the veterinary profession may recognize it and be able to describe its function.

A Microscopic Test for Quality of Milk*

The efforts put forth to produce milk and milk products that are safe, and that meet reasonably high standards of quality, must be extended in at least two directions, (1) to determine the health of the cow, and (2) to determine the cleanliness of the cow and her surroundings, in addition to the construction and care of the equipment that is used in handling the milk before it reaches the consumer. The microscope can be applied in both of the above instances. The microscopic examination of incubated milk samples (37°C. for at least 12 hours) permits the accurate diagnosis of streptococcic mastitis in the dairy cow. The tuberculin test should be used for the diagnosis of tuberculosis and the agglutination test for the detection of Bang's disease. The microscope is also valuable in a rapid determination of the bacteria count of a sample of milk and, when the count is high, in determining the types of microorganisms and indicating the probable source of excess contamination during the process of milk production.

* Abstract of a discussion by C. S. Bryan, East Lansing, Michigan, Division of Veterinary Science, Michigan State College.

Disturbances in Animal Reproduction*

It has been estimated that on German territory from 1/5 to 2 millions of animals are examined and treated every year by veterinarians for sterility or other ailments of reproduction. The fecundity of animals plays such an important rôle in the breeding of livestock and in public economy that one visions the necessity to create official organizations, encouraged by the state or by private initiative, which would be charged with the regular control of breeding establishments in order to disclose the ills of reproduction functions and to seek remedies.

Prof. Dr. Richard Götze (left), director of the obstetric and cattle disease clinic at the Hannover Veterinary College, being congratulated by Prof. Dr. R. Manninger, Budapest, Hungary, upon the excellence of a motion picture film he had just shown depicting the procedure and methods employed in Germany in artificial insemination as practiced in horses and cattle. The picture was shown in one of the down town theatres in Zurich during the XIII International Veterinary Congress. The showing was largely attended, not only by members of the Congress but by the public as well

Above all the cause of troubles should be sought in the influence of unfavorable surroundings to which a greater or lesser number of individuals composing the herd never become adapted.

It is evident that there exist individual hereditary differences concerning general aptitude to fecundity as well as hereditary individual predisposition to morbidity, but they play a secondary part only.

The influence of surroundings manifests itself in four different directions: in the breeding, in the care and feeding, in the appearance of specific infectious diseases, and the appearance of sporadic diseases.

There must be kept in mind the more or less artificial conditions under which domestic animals are bred, lest diseases be thought to exist when they do not. Ills of breeding functions caused by faults in care and feeding and by specific infectious maladies play the greatest rôle, and they are what must be avoided in the first place. Diversified feeding; farming methods looking not only to increased returns on fields and meadows but also to improvement of the forage in assimilable properties, in mineral salts and vitamins; a judicious choice of fattening feed; keeping the pasturage in perfect condition; these are the best means of fighting the breeding ills caused by irrational feeding methods or absence of hormones and vitamins. The last two groups of substances often do not suffice to bring about an improvement when administered by the clinician because it is not possible by present methods to determine which is lacking in a case of sterility in young animals free of infectious diseases.

Active prophylaxis represents the surest and most efficacious means of combating reproduction ills of infectious origin: progress in diagnosis, finding and eliminating suspected individuals and germ carriers, isolation measures, treatment of the sick and suspected animals or slaughter if necessary.

When faulty feeding or infectious diseases are not the cause, ills of sporadic nature must be looked for.

*Summary of a report presented by Prof. Dr. R. Götze at the 13th International Veterinary Congress.

Conditions Governing the Origin and Development of Infectious Diseases

By PROF. DR. P. J. DU TOIT,
Onderstepoort, Pretoria, Union of South Africa,
Director of Veterinary Services, Dept. of Agriculture

"INFECTION," for the purpose of this address, may be defined as the entrance of microorganisms into the body and their multiplication therein. And an "infectious disease" may be regarded as a condition in which the infective microorganism can be transmitted from one individual to another thereby causing the same disease in the second individual as existed in the first. An important feature of an infectious disease is its tendency to spread amongst susceptible individuals, essentially in the same way as a fire will spread in combustible material if a spark is introduced.

In the present state of our knowledge we think of these microorganisms as belonging to three categories: bacteria, protozoa, and viruses. In some instances, however, macroorganisms (e. g., mites, worms, etc.) may also cause conditions which behave exactly like true infectious diseases; but in the main our remarks will be confined to diseases caused by the three types of organisms first named.

Losses due to infectious diseases have probably been sustained by man ever since he first acquired and bred domestic animals. Indeed, the ravages caused by infectious diseases in bygone centuries were probably proportionately much heavier than they are now, if we take into consideration the much smaller animal population at that time. Therefore when we read, for instance, that the losses from rinderpest in Europe up to the end of the 18th century amounted to 200 million cattle; or that Holland during the decade 1820 to 1840 lost about 600,000 cattle from pleuropneumonia; or that in one year (1892) Germany suffered a loss of 100 million marks on account of foot-and-mouth disease; or that in Hungary two million pigs contracted swine fever in the years 1895 to 1898; or that Southern Africa (south of the Zambesi River) lost over five million cattle from rinderpest during the two years 1896 and 1897; we realize what a profound influence infectious diseases have had on the development of animal husbandry. The losses due to some of the diseases just mentioned have certainly been reduced greatly in recent years; but we still hear that not very long ago the United States lost on an average about 200 million dollars annually on account of animal diseases, chiefly infectious diseases.

In view of the enormous economic importance of infectious diseases in animals it behoves us to study carefully the conditions which govern their origin and development.

Origin of Infectious Diseases

An infectious disease will appear in a country or area only when and if the infective agent (the "spark" to which reference has been made) is introduced into susceptible animals. Very commonly this occurs through the introduction of an infected animal (perhaps in the incubative stage of the disease) into a clean herd. Most countries take elaborate precautions to prevent such introductions, by means of systems of quarantine and by inspections on their borders or at suitable centers within the country. But modern methods of transport, particularly by air, have increased this danger enormously. The introduction of rabies into England in 1918 by means of a dog which was smuggled in from France in an aeroplane, illustrates the danger to which countries, even isolated countries, are exposed to an ever increasing degree. In this in-

*Presented at the XIII International Veterinary Congress, Zurich-Interlaken, Switzerland, August 21-27, 1938.

stance it took the authorities several years of hard work to free the country again of this dreaded disease.

But it is not always necessary that an infected animal be introduced. The infected material may be carried mechanically in the hair or wool of healthy animals (e. g., the virus of sheep-pox) or in the hide (e. g., anthrax spores); or it may be carried by man on his hands or clothing (e. g., the virus of foot-and-mouth disease); or it may be conveyed in the carcass or the meat or fat of infected animals (e. g., the virus of swine fever); or again the infection may be transported by "carriers," i. e., animals which have recovered from the disease but which still harbor the infection, which they are capable of transmitting to other animals (e. g., pleuropneumonia). Such carriers are very common in many protozoal diseases (piroplasmosis, trypanosomiasis, etc.). These animals appear perfectly healthy but carry the infection in a latent form (state of premunition) and may be responsible for a fresh outbreak of the disease.

Carriers may also consist of a species of animal which normally does not show clinical signs of the disease, but may yet convey the infection to the susceptible species. Examples of this type of infection are not uncommon—the best known is probably that of game carrying nagana—but two further cases may be mentioned here because of their special interest.

In the Northern Transvaal it was found that two species of wild pig, the bush pig *(Kairopotamus choeropotamus)* and the wart hog *(Phacochoerus œtiopicus)* were carriers of hog cholera, although they never show any symptoms of the disease. However, when they come in close contact with domestic pigs, as sometimes happens on the more remote farms, they may be responsible for a fatal outbreak of the disease. The second example concerns a disease called "snotsiekte" in South Africa (a form of malignant catarrhal fever). In this case two species of antelope, the black wildebeest *(Connochaetes gnu)* and the blue wildebeest *(Connochaetes taurinus)* act as carriers of the infection. When they come in close contact with domestic cattle a serious outbreak of snotsiekte may result.

The spark of infection may also be intro-

P. J. Du Toit

duced in other ways. In the case of diseases transmitted by an intermediate host it is sufficient that an infected specimen of this vector be brought into contact with susceptible animals. Thus an infected tick may be carried a long distance, e. g., in hay, and then find its way on to a susceptible beast. There is no doubt that in South Africa, East Coast fever has been carried in this way more than once, and some obscure outbreaks of this disease must probably be attributed to a native conveying an infected tick in his blankets. Similarly, infected tsetse flies may be conveyed in motor cars or by other means and then set up an infection in a previously clean area.

Do New Infectious Diseases Arise?

Laymen frequently ask the questions, "Where did this disease originate?" "When did it first appear?" "Are any new diseases likely to arise which might exterminate our animals or mankind itself?" Such questions should perhaps be addressed to philosophers and theologians rather than to men of science. And yet we are not entirely at a loss for an answer. We may not actually have observed new diseases appearing as if by a process of spontaneous generation, but we can certainly see before our eyes new diseases being produced by a process of differentiation from a common stock. How else are we to interpret the existence

of different strains of bacteria or viruses than through differentiation of a single species into separate strains? When the process has gone far enough we speak of different diseases; before it has gone so far we speak of varieties of the same disease. Examples could be quoted by the score; a few only will be mentioned here. (1) Three immunologically different strains of foot-and-mouth disease have been recognized for some years. However, recent work would indicate that the antigenic structure of the three strains is not so different as was at one time thought. It would almost appear as if the process of strain-making is still going on actively. (2) In horsesickness a somewhat larger number of strains has been identified; apparently the process of differentiation has gone somewhat further in horsesickness than in foot-and-mouth disease. (3) In the United States of America two strains of equine encephalomyelitis, the eastern and the western, have been studied. The strains differ, not only immunologically but also in their effect on the animal (clinical picture) and in the method by which they are transmitted. Again this disease bears a close resemblance to Borna disease, but is regarded by most authors to be sufficiently distinct to warrant a separate name. Thus we see here a process of splitting which apparently, in the case of Borna disease and encephalomyelitis has gone far enough to have produced two distinct diseases, but in the case of the two strains of encephalomyelitis in America has not gone so far.

We may continue this line of reasoning and point to the group of pock diseases where, according to most authorities, we have arrived at a stage where we can speak of six or eight different diseases: smallpox, cow-pox, sheep-pox, goat-pox, horse-pox, swine-pox, camel-pox, rabbit-pox. One member of the group, namely ecthyma contagiosum ("viulbek," "sore-mouth") has become separated a bit further than the rest, and is generally regarded as a separate disease. Some of the members of the pock group are so closely allied that many authors regard them as strains of the same disease, but consider the others as separate diseases. Obviously the process of differentiation has gone a stage further in this group than in the encephalomyelitis group, although there can be little doubt that these pock diseases too originated from a common ancestral stock.

Further differentiation still may be considered to have taken place in other groups of similar diseases. The influenza group furnishes a good example. Influenza catarrhalis, influenza pectoralis, and infectious cough (Hoppegarten disease) of horses, infectious bronchitis of cattle, swine influenza and human influenza all have features in common, but have become separated so far that no one doubts their independent identity.

Many more examples could be quoted, but enough has been said to indicate the lines along which differentiation may proceed. Given a single disease we may picture to ourselves a process in which first of all, the variability inherent in all living matter will lead to the appearance of separate strains; these may then, probably by adaptation to different climatic conditions and to different modes of transmission, become differentiated into entirely separate diseases. It is not difficult to conceive that a group of diseases including, say, foot-and-mouth disease, vesicular stomatitis, vesicular exanthema, rinderpest, malignant catarrh of cattle, "bluetongue" of sheep, and perhaps others, all of them diseases with a peculiar affinity for the mucous membranes, but differing in many important features, may, by such a process of differentiation, have originated from a common parent stock.

Or again the group of "neurotropic" virus diseases, such as rabies, pseudorabies, Borna disease, encephalomyelitis, louping ill, etc., may have had a common origin. It seems probable that the diversity in this group was brought about by adaptation to entirely different modes of transmission (by direct bite in the case of rabies; mosquitos in the case of encephalomyelitis; ticks in the case of louping ill, etc).

There are yet other ways in which apparently "new" infectious diseases may arise. Mention has already been made of diseases

like swine fever and "snotsiekte" which may be present in wild animals in an "inapparent" form, but which may flare up when these latent carriers come in contact with susceptible animals. In these cases a new infection may appear to arise from nowhere, unless the role played by the wild animals is known.

But more instructive still is the position in regard to *trypanosomiasis*. We may assume that in the course of time a perfectly harmonious relationship developed between trypanosomes, tsetse flies, and game. It is doubtful whether the trypanosomes at any stage caused "disease" in the game. And the tsetse flies acted as innocent carriers of the trypanosome from antelope to antelope. But then at some stage man with his domestical animals appeared upon this peaceful scene. The tsetse flies now found a new food supply near at hand and conveyed the trypanosome infection to these animals. But no such harmonious relationship existed between trypanosome and domestic animal, as had developed by a gradual process of evolution between trypanosome and game, and the result was a fatal disease. This is no fanciful picture. The same process may be repeated at any time by taking cattle or other domestic stock into a tsetse fly belt where the game harbor trypanosomes.

The question may be asked, do we know of new diseases which have appeared in recent years? And the answer seems to be in the affirmative. Even if we take into account the possibility that the appearance of supposedly new diseases may be due simply to more accurate diagnosis and improved methods of investigation, we still have a number of diseases which definitely seem to have appeared for the first time, at any rate in civilized countries, in very recent years. Two examples may be quoted. Swine influenza was first observed in the Middle West of the United States of America in 1918. Since then the disease has spread to many countries. It is such a distinctive and easily recognizable disease that it must of necessity have been recognized before, had it existed. Meanwhile we know nothing about its origin.* The second example is canine hysteria. This disease first made its appearance in the southern states of the United States of America, about 1916. It reached Canada about 1920 and first appeared in England about 1924. Today it is recognized as a definite disease in many parts of the world. Again its origin is completely obscure.

*The work of Swope justifies the conclusion that swine influenza is due to the same virus that caused the world wide pandemics of influenza in man in 1893 and 1918.

The Spread of Infectious Diseases

The rapidity with which a disease will spread depends very largely on its mode of transmission. Probably the slowest form of propagation is encountered in diseases such as tetanus or quarter evil where the infecting organisms are found in the soil. A somewhat similar condition exists in the case of "lamsiekte" a form of parabotulism of cattle in South Africa and other countries. Here the bacteria are also present in the soil and in this way may enter bones or other carcass material in which they produce toxins; when this material is eaten by an animal the disease is produced.

In diseases which are transmitted by contact the spread of infection is much more rapid. Before the days of fast mechanical transport the rate of spread was determined by the movement of the animals themselves. The great epizoötic diseases periodically swept across Europe from east to west, and it usually took a few years before the infection reached the western countries. An interesting example of this mode of spread is furnished by the invasion of Africa by rinderpest at the end of last century. According to Lugard the disease crossed the Red Sea from Arabia into Africa in 1889. It then travelled southward along the Nile with the Italian armies in 1890 and continued its southward course through Africa. Uganda was reached before the end of the year, and Nyassaland about July 1892. In February, 1896, it was reported on the banks of the Zambesi River and in March Bulawayo was reached. The disease appeared at Mafeking in April, 1896, and at Kimberley in October. It was checked for a time on the Orange River by a fence, but in March, 1897, it appeared south of the

line and before long it had spread practically to the southernmost point of the continent. It was stated at the time that the disease travelled at the same rate as an oxwagon.

With modern means of transport long distances can be bridged in a short time. In this way infectious diseases have been carried to distant countries and frequently great losses have been inflicted. As a classical example may be mentioned the introduction of surra into the island of Mauritius in 1901 by means of cattle from India. The disease spread rapidly on the island and killed off a large percentage of the animal population. The same disease was introduced into South Africa with camels from India in 1904; into the United States with zebus in 1906, and into Australia with camels in 1907. In all these cases the disease was eradicated by slaughtering the infected animals. Similarly rinderpest was introduced into Belgium in 1920 by zebus from India. And in 1923 this disease also broke out in Western Australia having been brought there with animals from Singapore. But both outbreaks were very soon suppressed.

The spread of infectious diseases is favored not only by transportation over long distances but also by the movement of animals within a country. Markets and sales are fruitful sources of infection. Here animals are brought together, perhaps from long distances, and contact is established with a large number of animals which may again be distributed over a wide area. Also the activities of traders who go about buying animals on the farms and move from farm to farm, must be looked upon with suspicion. Hog cholera has frequently been spread in this way.

But even genuine farmers, who sometimes have to move their animals over long distances, may be responsible for the spread of diseases. In South Africa scab in sheep would probably have been eradicated long ago but for the extensive movements of sheep especially in times of drought. And most outbreaks of East Coast fever must be attributed to a similar cause.

Any event which may lead to large-scale movements of animals across a country or across a continent may cause infectious diseases to spread. In this category of events wars take the first place. Indeed many of our most important epizoötics may be termed war diseases. Thus the history of rinderpest in Europe during the last few centuries is virtually a recapitulation of the history of the wars of that period. Even in modern times this disease has followed in the wake of wars. Bulgaria became infected during the Balkan war in 1913; and during the Great War of 1914-1918 the disease spread rapidly in Russia and invaded Roumania, Bulgaria, Poland and Greece.

Many other diseases accompany wars: glanders, epizoötic lymphangitis, ulcerative lymphangitis and mange in horses were all prevalent during the last war, but practically disappeared soon after. Infectious anemia spread to an alarming extent all over Europe and to countries outside Europe. Even pleuropneumonia appeared in countries (e.g., Germany) from which it had been absent for many years. That a highly contagious disease like foot-and-mouth disease should spread rapidly during war time is not surprising in view of the reduced efficiency of the state veterinary service under such conditions.

The Spread of Non-Contagious Diseases

Equally interesting is the study of the spread of diseases other than contagious diseases. Of special interest are those transmitted by arthropod vectors. If the transmission is effected by winged insects it is not surprising that the disease should spread rapidly over a wide area; but when the transmitter is a tick with its very limited powers of locomotion, the opposite would be expected. And yet we find that a disease like redwater of cattle (Texas fever) or East Coast fever can spread just as rapidly and far more insidiously than most directly contagious diseases. The history of the original introduction of East Coast fever into and its spread over Southern Africa is interesting and instructive. The infection was brought in 1901 with a consignment of cattle from Tanganyika to Beira in Portuguese East Africa. From Beira

the cattle were sent to Umtali and Salisbury in Southern Rhodesia, where they were grazed on the townlands and where mortality occurred amongst them before they were slaughtered. In the light of subsequent experience we know that infected ticks must have dropped on the pastures where these cattle grazed. Later in the year 1901 one thousand head of cattle were sent from Australia to Rhodesia. These cattle were also landed at Beira and grazed there before they were sent to Umtali. At both centers heavy mortality occurred until practically the whole herd had died. Still the authorities did not suspect a new disease but ascribed the mortality to redwater. It was only when Rhodesian cattle also began to die in great numbers at these centers and when the disease began to spread to other areas that it was realized that a new disease had invaded the country. Soon almost the whole of Southern Rhodesia was infected and in 1902 the disease spread into the Transvaal. During the next two years a great part of Natal and the adjoining territories also became infected. Here then we have a disease transmitted by a tick which can convey the infection by only the slow process of dropping off the infecting animal, moulting on the ground after the lapse of several weeks, then crawling on to a susceptible animal and engorging itself with blood over a period of several days. And yet we find that the disease can spread over a large section of a continent in a few years. Moreover the infection may persist, thanks to the longevity of the ticks, for a long period in an area where once it has established itself.

Enough has been said to indicate the diversity of methods which operate in the spread of infectious diseases.

Factors Influencing the Spread of Infectious Diseases

The factors which have an influence on the spread of an infectious disease may be grouped into three categories: (1) factors connected with the animals themselves, their susceptibility, etc., (2) factors connected with the virus itself, its pathogenicity, etc., and (3) factors connected with external conditions such as climate, nutrition, etc.

The first group of factors will be dealt with by Professor Frei and needs no further reference here. For convenience the third group of factors will be discussed first.

That the soil has an important bearing on the origin and development of infectious diseases, has long been known. Mention has already been made of diseases like tetanus, quarter-evil or "lamsiekte" (parabotulism), the causative organisms of which may be found in the soil. The last-named disease has features of peculiar interest. Long before the etiology of this disease was understood it was realized that there was some connection with the soil. Sir Arnold Theiler was so convinced of this relationship that, at one stage of the investigation, he had a hundred tons of soil transported from a "lamsiekte" area to a clean area, to see if he could reproduce the disease in this way. Later on Theiler found that the ultimate cause of lamsiekte was the phosphorus deficiency of the soil, which was responsible for the phosphorus deficiency of the pasture and hence also for the phosphorus deficiency of the cattle grazing on such pasture. In order to satisfy their craving for phosphorus these animals then chewed bones or other animal débris and in this way ingested the toxin which produced the disease. Thus the soil plays a double role in the causation of lamsiekte, firstly through its mineral deficiency and secondly through the bacteria which grow in the carcass material.

The soil may also be an important factor in the spread of worm infections. Mönnig has shown that *Gaigeria* (the hookworm of sheep) will thrive only on sandy soil.

Rainfall is another very important factor in the spread of infectious diseases. Many diseases are propagated only under humid conditions. Frequently this is due to the fact that the vector of the disease needs moisture for its multiplication and other activities. Thus we find that both horsesickness and bluetongue (catarrhal fever) of sheep in South Africa are entirely depend-

ent on the rainfall for their spread. If heavy rains fall early in the season, both diseases will be very prevalent; on the other hand, when there is a dry season, the diseases are almost absent. These diseases usually start about two or three weeks after the first rains. This is the period in which the vectors presumably hatch and infect the animals.

But rainfall may have a pronounced influence even on diseases which are directly transmitted. Thus it has been shown that fowl cholera has a very much higher pathogenicity in a humid than in a dry atmosphere.

The *vegetation,* which is in a sense the product of soil and rainfall may also have a direct bearing on the distribution of some diseases. This applies particularly to the trypanosome diseases whose vectors, the tsetse flies, depend to a great measure on the type of vegetation. Some species can exist only in dense tropical forest, others in park land, and yet others in the drier open country. Naturally the spread of the trypanosomes carried by these species will be determined by these factors.

Temperature is another factor to be considered. When we speak of tropical diseases we think in the first place of diseases which will thrive in a hot climate. But it is unlikely that the temperature alone determines the distribution of a disease. Usually it is a combination of all the factors which constitute climate. In heartwater, for example, we find that the vectors, ticks of the genus *Amblyomma,* occur only in warm and moist places and this has been the determining factor in the spread of this disease.

However, there may be conditions when temperature alone plays an important part in the development of a disease. Thus Nuttall and others showed that ticks infected with East Coast fever, when kept at a low temperature (10°C.) for three weeks, are incapable of transmitting the disease, but regain their infectivity when warmed to 30°°C. for two days. A sufficiently high temperature is therefore quite essential for the spread of East Coast fever.

But if hot weather favors the development of certain diseases, direct sunshine may be inimical to others. We know that most viruses are destroyed fairly easily when exposed to the sun, and even the majority of bacteria cannot withstand the action of direct sunlight for long. This may explain the relative mildness of diseases like foot-and-mouth disease and their tendency to die out spontaneously in tropical countries. And yet, in other cases, diseases which are usually associated with cold, damp, and foggy countries, may flourish in warm and sunny climates. An interesting example was revealed some years ago when a severe outbreak of tuberculosis was discovered in a number of Kudu *(Strepsiceros strepsiceros)* in the Albany district of the Cape Province in South Africa. These animals are completely wild and run in an area which has a low rainfall and a maximum amount of sunshine; but in spite of this the disease spread readily amongst them. Sunshine cannot therefore be regarded as an absolute safeguard against infection.

Apart from these climatic factors there are other conditions which are of importance in the spread of a disease. One such factor is nutrition. Generally speaking animals in good condition have more resistance to disease than those in poor condition. In countries like South Africa where severe droughts are of fairly frequent occurrence, infectious diseases take a heavy toll of the half-starved animals during such periods. This is specially true of worm infestations which may spread to an alarming extent and cause very severe losses during a period of drought.

The individual factors responsible for this increased susceptibility need not be discussed here. A deficiency of Vitamin A is generally regarded as predisposing towards infection. But in most cases it is a general lack of food, a condition of semi-starvation, which leads to a spread of disease.

With regard to certain diseases the opposite view has also been held. Edwards has shown that rats on a good diet are much more susceptible to foot-and-mouth disease than those on a deficient diet. Whether the same applies to cattle is still doubtful. In this connection it should be borne in mind that the conditions necessary for the spread

of an acute virus disease need not be the same as those which favor the development of a chronic bacterial infection. Thus the view is quite acceptable that tuberculosis (in human beings) spreads easily in undernourished individuals whereas epidemic influenza seems to favor strong, well-fed persons.

Another "external" factor which has an important bearing on the spread of infectious diseases is the density and distribution of the animal population. Obviously a disease will spread more readily if the animals are crowded together than if they are distributed in small groups over a wide area. The prevalence of swine diseases in countries like the United States, Germany, Austria, etc., is probably in large measure due to the intensity of swine husbandry and the density of the swine population; whereas in countries like South Africa where the swine industry is not far advanced and where hogs are usually kept in relatively small numbers on widely separated farms, most swine diseases are comparatively rare and some (e. g., swine erysipelas) completely absent.

But this factor may also operate in the opposite direction. In countries where a particular animal industry is well advanced it generally also means that the animals are kept under proper control and that effective isolation can be carried out. On the other hand, in less developed countries there may be fewer animals but these probably roam about on large unfenced areas and proper isolation or quarantine becomes a very difficult matter. An excellent example is supplied by dourine of horses. This disease spread all over Europe during last century, but with the advance in the horse-breeding industry and the improvement in state veterinary control, it was completely eradicated from practically all European countries by the beginning of this century. Then during the great war the disease was introduced again, but within a comparatively short time it was eradicated once more. In contrast with this successful campaign in Europe may be quoted the experience in South Africa where the disease has spread to the sparsely populated areas in and around Griqualand West where veterinary control is exceedingly difficult. From this area the disease was transported to the more closely settled districts at the southernmost point of South Africa, but within a few years it was eradicated from this area; whereas the progress made in the northern area is very slow indeed. The brilliant success which Watson and his co-workers had in the eradication of dourine from Canada is all the more meritorious when the wild state of the infected country is taken into consideration.

Another factor to be considered is the nature and distribution of the reservoir. Certain phases of this problem have already been discussed; however, mention should still be made of the peculiar conditions which determine the spread of *rabies*. In most countries where this disease occurs, the infection is carried from dog to dog. An infected dog may bite other dogs as well as other animals or human beings, and so the disease may spread over the length and breadth of the country. But in some countries there are interesting departures from this "standard" mode of transmission. Thus in South and Central America it was found that vampire bats *(Desmodus rotundus* and perhaps other species) are carriers of rabies. Until this extraordinary fact had been established, the origin and development of the disease had presented some very obscure features, and for a long time the diagnosis was in doubt. A different type of transmission is encountered in South Africa. Here small carnivores form the natural reservoirs and transmitters of the disease. The chief culprit is the yellow mungoose *(Cynictis penicillata)*, but other members of the families *Viverridæ, Felidæ,* and *Sciuridæ*, may also act as carriers. Why in these countries these animals, and not dogs, should be the carriers of rabies, we do not know. Dogs do get infected in South Africa and die, but they do not seem to propagate the disease. The fact remains that the spread of rabies in these countries is very different from that observed in countries where dogs are the principal carriers.

So far only "external" factors have been discussed, i. e., factors connected with soil

or climate or nutrition or the distribution of animals. But, as indicated above, there are "internal" factors, i.e., those connected with the animal itself or with the infective agent which may also have a profound influence on the spread of a disease. Only the latter type of factor will be mentioned here briefly.

The *virulence* of an organism may vary very considerably. Perhaps the best known example of such variability is foot-and-mouth disease. Usually a mild disease with practically no mortality in adult cattle, it may suddenly appear in a virulent form and cause the death of a fairly large percentage of animals. This happened in 1920 in Europe. The disease had been present in a mild form for some years, and then became more and more virulent.

Virulence and infectivity do not necessarily go hand in hand. Panisset has made the interesting statement that sheep-pox is as virulent today as it has ever been, but that its infectivity has diminished. A mild disease may spread rapidly, or a virulent disease slowly. But virulence does influence the general complexion of an epizoötic disease, inasmuch as the higher percentage of deaths may provide more "fuel" for the "conflagration."

In some diseases virulence is connected with recognizable strains of the infective agent. For instance in various bacterial diseases it has been found that the virulent strains produce smooth colonies, whereas the avirulent strains produce rough colonies. Sterne has recently confirmed the finding that anthrax is no exception to this rule.

However, in many other diseases virulence does not seem to be a property of any particular strain. The three recognized strains of foot-and-mouth disease virus do not show constant differences in virulence, but each of them may vary independently. On the other hand, in horsesickness some strains are definitely more virulent than others; of the strains used at Onderstepoort the so-called O-virus is more virulent than the N-virus and this again more virulent than the Tzaneen-virus.

With the appearance of a more virulent or a less virulent strain a disease may alter its course completely.

Types of Epizoötics

With so many factors influencing the spread of epizoötic diseases, it is no wonder that their characteristic features vary widely.

The first type may be likened to a fire which sweeps through a forest or a prairie and does not cease until all the combustible material has been consumed. This type is illustrated by a disease like rinderpest. We have seen how in Southern Africa, for instance, it swept right through the country until the supply of susceptible cattle was exhausted.

Some diseases of this type may sweep through a country in successive waves following on each other at intervals of a few years. The duration of these intervals is determined by the time it takes for a new generation of susceptible animals to grow up. Waves of foot-and-mouth disease have swept through Germany in the years 1892, 1896, 1899, 1911, 1915, 1920, 1924, 1926.

An extraordinary feature of this periodicity is the appearance or the disappearance of the disease in different countries at the same time. Thus foot-and-mouth disease after a period of quiescence spread to an alarming extent during the year 1933 both in France, Belgium and Holland. In the years following, the number of outbreaks decreased markedly and, in some countries, it seemed on the point of complete eradication. And then in the autumn of 1937 it suddenly flared up again almost at the same moment in Holland, France, Belgium, Germany and England. It appeared as if some unknown epizoötological factor was operating in all these countries at the same time.

A similar periodicity has been observed in swine erysipelas. In Germany the disease was prevalent in the years 1903, 1906, 1910, 1913, 1916, 1921 and 1924.

The seasonal nature of some infections is not quite comparable with the periodicity which has just been discussed. In the former case the diseases appear regularly every year at the same season, and the

explanation for this is usually to be found in the influence which the heat of summer or the rainfall or some other factor has either on the causative organism itself or on the vector of the disease. Examples of this nature have already been quoted. One further example may be mentioned: In South Africa the disease known as "sweating sickness" of calves appears every year during the hottest months (January, February and March). Rainfall seems to have no influence on the incidence of the disease. Although neither the etiology nor the mode of transmission of this disease is known, it is safe to conclude that either (or both) of these factors is dependent on heat, and probably heat only, for its development.

There is a gradual transition from the type of infection known as epizoötic (epidemic) to that known as enzoötic (endemic). As a matter of fact, practically any epizoötic disease may become enzoötic. Rinderpest and foot-and-mouth disease, which may be regarded as typical epizoötic diseases, have both become enzoötic in Central Africa, and have probably been enzoötic in Asia for centuries. Frequently (but not always) the process of becoming enzoötic may be accompanied by a reduction in virulence, although this change may be more apparent than real. What often happens is that the reduced mortality in adult animals is achieved at the cost of disease and death in the young. If for instance, a disease like redwater (Texas fever) or anaplasmosis becomes enzoötic in a country the young calves contract the disease and many may die; the premunition established in the survivors will protect the animals in adult life; but there will probably be no reduction in the virulence of the original strain.

The question whether, in a country where a disease is enzoötic, the animals will gradually acquire a greater and greater resistance against that disease, is one which needs further investigation. It has been claimed (by Rickmann) that a breed of horses with a high degree of resistance against horsesickness has been evolved by the natives in the Ngami area of Bechuanaland.

Whatever the process of adaptation may be, the fact remains that diseases which have become enzoötic have, in many cases, lost the terror which they inspired in their epizoötic state. This applies particularly to naturally mild diseases like foot-and-mouth disease. In Central Africa very little notice is taken of this disease. And even rinderpest is apparently feared much less than when it first appeared as an epizoötic.

Do Infections Die Out?

Many infectious diseases have, of course, been eradicated by human agency. But the question to be answered at the moment is: Can infectious diseases disappear spontaneously? The answer to this question is probably in the affirmative, but it must be qualified. Diseases have disappeared, not perhaps from the globe, but certainly from certain countries. Nagana which was prevalent in the Transvaal 100, and even 50 years ago, has completely disappeared from this Province. In this case several factors probably operated, the chief of which was the wholesale destruction of big game by rinderpest in 1896, which caused the tsetse fly to disappear completely from this part of the country.

Foot-and-mouth disease is another disease which has disappeared spontaneously from South Africa. It may have been present here for a long time previously, but was definitely diagnosed in 1892 and the years following. However, in 1895 or 1896 it seems to have disappeared completely. It is possible that the advent of rinderpest in the latter year may have had something to do with the disappearance of foot-and-mouth disease.

More recently we have seen another disease disappear from South Africa, namely infectious anemia of horses. This disease was first diagnosed here in 1914. Various natural outbreaks were recorded and the disease seemed fairly wide-spread. However, for the last 10 years or more no trace of the disease has been seen. Probably the conditions were not favorable for the virus or its vector, although the disease seems to flourish in other countries with a climate similar to that of South Africa.

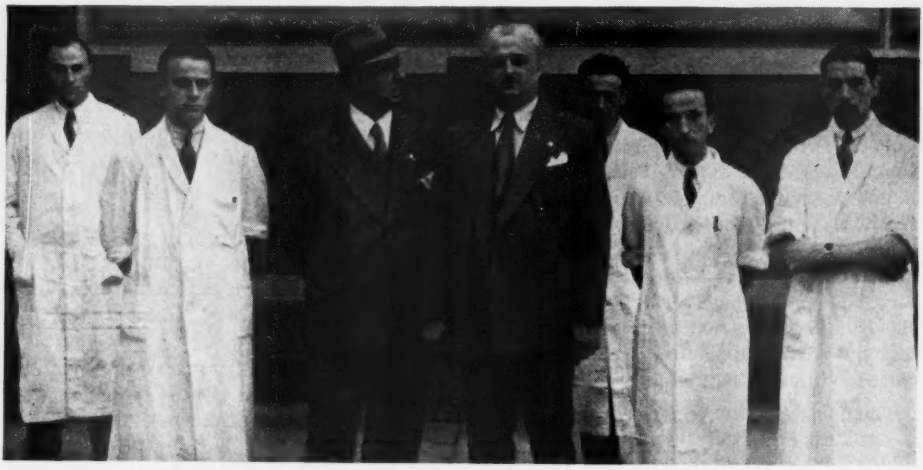
At the beginning of this article reference was made to the origin of infectious diseases. It was shown how the first appearance of a disease like nagana can be explained on the assumption that a state of friendly symbiosis developed between trypanosomes, tsetse flies and game, which was disturbed only when man arrived on the scene with his domestic animals. Without unduly taxing our imagination we may presume that in course of time the trypanosomes will also adapt themselves to the domestic animals and nagana as a disease will disappear. A similar process can be imagined in many other diseases. But perhaps man with his ingenuity and the application of modern science will have eradicated all these diseases long before such an adaptation will have had time to take place.

Prospects for the Future

No undue amount of optimism is needed to imagine that within measurable time the major infectious diseases will be brought under control. It is said that the first veterinary colleges in Europe were founded (towards the end of the eighteenth century) with the primary object of studying rinderpest. For more than a hundred years veterinary science grappled with this problem until at last practically all Europe was freed of the disease. And when it did appear again in 1920 it was eradicated with surprising ease.

This example may serve to illustrate the remarkable progress which has been made in veterinary science especially since the beginning of this century.

Our mastery over the infectious diseases of our domestic animals depends on our knowledge of those diseases and of the conditions which determine their origin and development. Some of these conditions are beyond human control, but others can be influenced by us. The world looks to us to safeguard the health of our domestic stock and to prevent the misery and desolation which, in the past, followed in the wake of the great epizoötics. We dare not fail in this trust.



UNIVERSITY OF MILAN VISITED BY AMERICAN VETERINARIANS

Above are shown Prof. Guido Finzi, dean (Directore) of the veterinary college in Milan (center), and six members of his staff. The photograph was taken August 30th in front of the Pathology building of the school on the occasion of a visit of a number of American veterinarians touring Europe during August and September, 1938. The visitors were favorably impressed by the facilities for instruction afforded by the school and particularly interested in Prof. Finzi's researches into the manufacture of tuberculin. Finzi does not agree with the prevailing belief in America that the Dorsett synthetic medium is superior to or even equal to the media used in Italy for the production of tuberculin for diagnostic use. Professor Finzi has visited America and was personally acquainted with a number of the visitors. His cordiality was much appreciated.

Interrelations of Veterinary and Human Medicine*

By DAVID J. DAVIS, Chicago, Illinois,
Dean of College of Medicine, University of Illinois

THE unity of the problems of veterinary and human medicine was well recognized by the ancients, as exemplified by numerous references in literature to plagues common to animals and man. In the plague of Athens, 430 B. C., one of the great catastrophes of the world, it was reported that humans and animals, victims of the plague, lay dead in the streets for days. Virgil in Italy, 2000 years ago, wrote his classic description in verse, of anthrax, one of the greatest scourges of animals and humans in both ancient and modern times.

Owing to the emphasis naturally placed upon therapeutic measures and the cure of disease in prescientific times, the fields of human and animal medicine developed apart. In both practice and education, separate institutions were created.

During the last century, with the rise of the sciences and with emphasis upon the natural history of disease, veterinary and human medicine began to draw closer together. The movement, almost imperceptible at first, was given a tremendous impetus by Pasteur, three-quarters of a century ago. France had been progressive along these lines for a long time. The first veterinary school of modern times was founded at Lyons, France, in 1762. This was a hundred years before the first veterinary school in America was founded at Toronto in 1862 and a few years even before the first Medical College in the United States was created at Philadelphia in 1765.

■ Pasteur viewed diseases as a broad field of science. He was a biochemist, and applied the principles of science to all diseases so clearly and so effectively both theoretically and practically that he became then and has remained to this day the greatest medical and veterinary man of all times. Beginning with chemistry and extending his activities into biology, especially micrology, he attacked successfully disease problems of the silkworm, of chickens, of domestic animals and of humans. His life work was a superb and dramatic illustration of logical sequence as applied to the study of all disease.

Pasteur also was responsible for the creation of the Pasteur Institute at Paris, founded for the broad study of disease. To this day this institute together with its official publication, "Annales de l'Institut Pasteur," has remained one of the most logical and ideal institutions for the comprehensive study of disease ever organized. Since Pasteur's time, the comparative study of disease has made commendable advances but until relatively recently, the progress was not rapid. The old artificial fences earlier erected and largely based on methods of treatment have continued to remain to the present time.

■ Medically, this is the century of preventive medicine and public health not only for man but also for animals. The preventive idea, which is merely applied science, is bringing out the true facts and relations in these matters on such a scale and in so impressive a way that our older organizations and conventional views are being rapidly superseded by more logical and effective ones.

Naturally the first step in such progressive work occurs not in institutions as a rule, but out in the field. With the development of new facts and principles institutions and organizations will be created, or, if such are in existence, will be modified and adapted to meet the changing situations. Both human and veterinary medicine have lagged in these new necessary adjustments.

*Read at 19th Annual Veterinary Conference at Urbana, Illinois, October 5, 1938.

There exists a striking example of a comparable situation in the field of mental disease. Until recently, mental diseases remained largely apart from general medicine. Our mentally afflicted were segregated in so-called insane asylums. With the newer developments largely made in field work and in the hospitals for mental diseases our medical and educational institutions are now being rapidly reorganized and new hospitals and institutions are being created in intimate relation to, or, rather, as an integral part of, our general medical program. We see this now going on before our eyes in our own institution by the erection of our new State Neuro-Psychiatric Institute on the Chicago campus of this university.

This age of preventive medicine also is causing medical education just now to be changed and modified in many ways. These changes are taking place in most medical colleges and institutions. They consist chiefly in devoting more time in the curriculum, first, to courses in the principles of public health and preventive medicine, and, second, to the task of permeating all the medical sciences, and especially the clinical branches, with the preventive idea.

Looking today over the broad field of the study of disease, especially in relation to prevention, the numerous diseases common to animals and man stand out conspicuously. Already much time in medicine is now being devoted to them and the trend is toward more and more emphasis in this direction.

However much our educational institutions may lag, the reports of field and experimental work coming to us every day are forcing the issue. It is gratifying to note that in medical institutions qualified veterinarians are now being added to the staffs and, *vice versa*, medical men are taking a proper place in veterinary colleges.

■ To bring this discussion more concretely before us, let us for a moment review briefly the diseases in Illinois that are now pressing for solution. Undulant fever, Rocky Mountain spotted fever, tularemia or rabbit fever, rabies, streptococcus mastitis, including milk-borne septic sore throat and scarlet fever, and staphylococcus food poisoning from milk. Also on the horizon, as it were, may be mentioned such diseases as listerellosis, swine erysipelas, actinobacillosis, psittacosis, and encephalitis. Undulant fever and Rocky Mountain spotted fever seem definitely on the increase as our state board of health has recently announced. Undulant fever is becoming a serious menace and in a way bids fair as a problem to take the place of bovine tuberculosis, now so largely under control. Mastitis in cows is now one of the largest disease problems in veterinary medicine and certain forms of it such as epidemic streptococcus infections and staphylococcus toxin poisoning are important human health problems.

To cope with the problems of these

The Illinois Veterinary Medical Association has petitioned the state university to establish a veterinary college. Veterinary education and a veterinary college in Illinois was one of the subjects of discussion at the annual veterinary conference at the University of Illinois, October 5-7, 1938. Dean Hagan of the New York State Veterinary College, Cornell University, Dean Giltner of the Division of Veterinary Science, Michigan State College and Dean Murray of the Division of Veterinary Medicine, Iowa State College, contributed to the program of this conference, as did also Dean Davis of the College of Medicine, University of Illinois. Dean Davis is head of the medical unit of the University of Illinois, which is located in Chicago, and comprises a medical college, a dental college, a pharmacy college, a nurses training school and a very large hospital. The majority of the veterinarians in the state would like to see the veterinary college, if one is established by the university, a part of this medical unit.

human-animal diseases from both the preventive and curative sides, research must be conducted on a broad basis. Our problems in the past have dealt largely with determination of the natural history of these diseases. Much still remains to be done. Witness this problem of encephalitis in horses and in children (*Science* 1938, Volume 88, page 305). Infantile paralysis also may prove to be a human-animal disease. In the future our greatest hope must be in the completion of our knowledge of the transmission of these diseases. To do this, these problems cannot be torn apart along such artificial and conventional lines as those that heretofore have separated human and veterinary medicine. This is especially true of research programs.

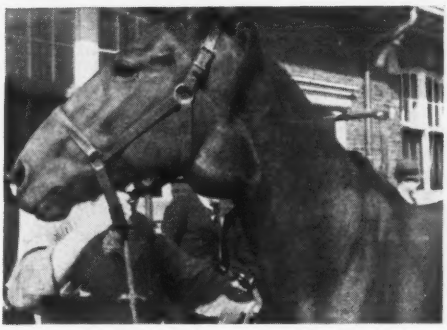
We in the medical profession are frank to admit that the human species is in a position to benefit far more from the veterinarian than the animal species from the physician. The reason is simple: The number of diseases of animals transmissible to man may be numbered by the score; whereas diseases of man transmitted to animals practically do not exist.

■ In thinking through this important problem one is reminded of other problems of coördination and coöperation in education and research. A year ago Dr. O. J. Hagen, a physician and a member of the Board of Regents of the University of Minnesota in a timely paper raised the broad problem of coöperation and coördination in higher education in this country; with the result that the American Council on Education undertook certain studies which led to the recent publication of an important monograph. (Studies: Coöoperation and Coördination in Higher Education, April, 1938. Series 1, Volume II, No. 5). In the concluding remarks the following statement appears:

This study *is* intended as a challenge to individual higher institutions, to each of the fields of scholarly and professional effort, and to every organized educational group to examine its specific situation and procedures for the purpose of discovering the opportunities for increased economy and effectiveness that may be realized through coöperative and coördinating efforts. Acceptance of this challenge should result in a great number of practical demonstrations of greater coördination, ranging in scope and importance from simple, small-scale efforts to those of nation-wide application.

It would seem an opportune time now to analyze carefully this problem from the point of view of interrelated science. Veterinary medicine, like human medicine, must fit itself more and more into our general program of public health and preventive medicine. In our own State our health record, while commendable, could be markedly improved by a more vigorous attack on a number of diseases. The expenditures for health in this state are not what they should be. In per capita costs, as indicated in the state health budget, Illinois ranks, among the states of the Union, down in the thirties. Considering the importance and wealth of this state, it should occupy a higher relative position. Our increased outlay for state health purposes might well include a liberal allowance for veterinary education and for the more intensive study of human-animal diseases.

I should like to appeal to veterinarians to consider this problem, not only from the standpoint of animal health but also from the standpoint of human health. Human medicine must have the aid of veterinary medicine for the solution of many of its major problems. It is now invading the veterinary field, and for its own protection and progress will continue to do so.



One of the clinical cases exhibited at the Ilinois Veterinary Conference Oct. 5-7, 1938. The history of this was that the tumor (which was fibrous) had developed rather suddenly, two years previously, and had remained unchanged since.

Parasitic Enteritis in Calves

By G. DIKMANS, Washington, D. C.
Bureau of Animal Industry

WHILE the roundworm parasites of sheep are generally recognized as the most serious obstacle to profitable sheep husbandry, especially in the sheep raising areas outside of the range country, the roundworm parasites of cattle have, thus far, received comparatively little attention. This neglect appears to be due chiefly to the high cost of using and maintaining cattle as experimental animals and to the fact that, as a general rule, mature cattle are not markedly affected by worm parasites. Gastrointestinal disturbances in calves are commonly ascribed to factors other than parasites. In the northern states, especially, roundworm parasites are seldom looked for as causes of digestive troubles in calves.

Although research into roundworm infestations in cattle has been extremely limited, it is known that at least two genera of nematodes are widespread among the cattle of the United States and that they have caused severe death losses in calves. Since internal parasitisms in cattle other than distomiasis has received but little consideration and further because the Cooperia and Ostertagi spp. are inconspicuous in the mass of ingesta in the stomach and intestines, the evidence at hand is such as to justify the suspicion that these nematodes may be responsible for far greater loss to the cattle industry than has hitherto been suspected. When greater care obtains in diagnosis it may be found that these nematodes are causing many obscure types of diarrhea and enteritis in cattle and are responsible for much unthriftiness in young and mature animals.

■ Among the more serious intestinal parasites of cattle are the members of the nematode genus Cooperia. These worms are about one-fourth to one-half inch long and brown in color when freshly collected. Because of their small size, they are easily overlooked on post-mortem examination.

Three species of the genus Cooperia occur in cattle in the United States, namely, *Cooperia punctata*, *C. pectinata*, and *C. oncophora*. *C. pectinata* appears to be prevalent in the South, this species having been collected from cattle in Texas, Louisiana, Mississippi, Georgia, and Florida. *C. oncophora* has a more northerly distribution, being reported from such widely separated states as Virginia, Vermont, and Montana. *C. punctata* has a much wider geographical distribution than either of the species just mentioned, having been collected from cattle in both northern and southern states. The known geographical distribution of *C. pectinata* and *C. oncophora* may be due to the fact that these species have not been sufficiently looked for. In a fairly large number of cattle examined in Louisiana and Texas, the writer encountered large numbers of *C. punctata* and *C. pectinata*, but failed consistently to find *C. oncophora*. In examinations of cattle from Virginia and Maryland, *C. pectinata* has not been found.

■ The histological pathology of the lesions produced by *C. punctata* in the small intestine of calves were described by See Lu Hung[3] in 1926 from preserved material collected from cases occurring at Bethesda, Maryland, and reported by Ransom[4] in 1920. From Hung's description it is quite apparent that this nematode is capable of producing serious pathological lesions in these animals. Neither Ransom nor Hung mention any disease condition or clinical symptoms associated with *Cooperia punctata* infestation.

Ackert and Muldoon[1] (1920) described an outbreak of parasitic gastroenteritis in calves in the vicinity of Manhattan, Kansas. The clinical symptoms were severe emaciation, anemia as manifested by pallor of the visible mucous membranes and skin, edema of the submaxillary region and profuse, watery diarrhea. The temperatures of the affected animals ranged from normal to 104°F. with respirations slightly below normal and pulse weak. Of 84 steers, 42 became visibly affected; 12 were so badly diseased that they had to be segregated, and nine died. On post-mortem examination large numbers of *Ostertagia ostertagi* were found in the abomasum and some *Cooperia* sp. in the small intestine.

Tunnicliff[5] (1932) described a condition of calves in Montana marked by a general appearance of emaciation, roughened hair coat, dull sunken eyes and a thin, profuse, fetid, and more or less bloody diarrhea, in which massive infestation of small strongyles, identified as *C. oncophora* and *Nematodirus helvetianus* was found in the duodenum and abomasum. Fifteen out of approximately 500 calves (short yearlings) were noticeably sick and two died. The diagnosis was complicated by the presence of coccidia and the primary cause of the condition, whether coccidia or worms could, therefore, not be determined.

Baker[2] has recently reported some cases of parasitic gastroenteritis in calves in New York and Vermont. The clinical symptoms mentioned were similar to those described by Ackert and Muldoon. The parasites responsible for these outbreaks were identified as *O. ostertagi* and *C. oncorphora.*

■ The Zoölogical Division of the Bureau of Animal Industry recently received from Dr. E. W. Roberts, Division of Animal Industry, State Department of Agriculture, Reynoldsburg, Ohio, a section of small intestine of a calf with a number of small nematodes imbedded in and attached to the wall. The worms were examined and found to be *C. punctata.* Doctor Roberts stated that a number of specimens from animals similarly affected had been submitted to him for examination and that in all cases examined, history and laboratory findings indicated that the animals in question suffered from parasitic enteritis. In response to a request for information concerning the clinical symptoms shown by the affected animals, Doctor Roberts informed the Bureau that the affected animals showed a profuse, watery diarrhea and became rapidly emaciated and anemic. This was followed by pronounced weakness, prostration and death in some cases. In one herd of 60 calves, 11 became affected and seven died. In another group of 25 calves there were 13 deaths. In other groups of animals in which fecal and post-mortem examinations indicated the presence of parasitic enteritis, no information could be obtained concerning the clinical symptoms exhibited by the affected animals.

■ A portion of the tissue mentioned above was submitted to the Pathological Division of the Bureau of Animal Industry for an opinion on the histopathological changes caused by the invasion of the wall of the intestine by *Cooperia punctata.* The pathologist reported that sections from the wall of the intestine showed extensive superficial necrosis of the mucosa in the more heavily infested areas, a number of parasites being embedded in this necrotic layer. Some parasites were also seen penetrating the mucosa to varying depths, and several encapsulated and partly degenerated parasites were observed in the deeper structures of the submucosa. The tissue reaction, consisting chiefly of chronic inflammatory changes, gave evidence of marked irritation caused by the invading parasites. The infiltrating cellular elements in the areas where the parasites occurred consisted largely of small lymphoid cells, a few large mononuclear cells and numerous eosinophiles. Large multinucleated cells were also noted immediately surrounding a number of the parasites in the submucosa. The submucosa was thickened as a result of the tissue changes, particularly in the areas where the parasites were found. The findings in this case indicate quite definitely that this parasite is capable of causing

definite pathological changes, resulting in considerable damage to the mucosa and submucosa of the invaded host.

Lesions similar, though not quite so marked, were observed sometime ago in the small intestine of some calves from Tifton, Ga. In this case both *C. punctata* and *C. pectinata* were found in the small intestine and it is, therefore, impossible to state which species was responsible for the lesions found.

These pathological findings do not differ markedly from those described by Hung, except that no evidence of "autoinfection," no embryonated eggs without shells and no developing larvæ were found in any of our preparations.

■ The cases of enteritis here reported and the other cases cited indicate that the small trichostrongyles of the genera *Ostertagia* and *Cooperia* are worthy of serious attention as possible causes of severe gastro-intestinal disturbances of calves, not only in the South but also in other parts of the United States.

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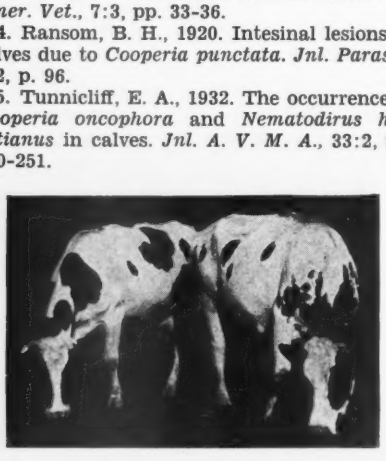

Hoof Grooving

The operation of "ringing" the hoof is well known, but many seem to be unaware of the excellent results to be obtained from it in cases suitable for operation.

The type of foot which answers well is that in which, when viewed from the side, the wall has a dished appearance, usually accompanied by a somewhat flat sole, or that which has been altered in shape by an attack of laminitis.

In feet of this kind, the lower half of the wall is not united with the os pedis through their laminæ, and, as a result, there is a certain amount of displacement of the os pedis which accounts for the flat sole. Horses with this type of foot have usually lost their action. The object of the operation, then, is to separate the lower detached or deflected portion of the wall from the upper attached portion, so that the new horn growing down is free from traction by the lower displaced portion. If this is carried out, the new horn growing down maintains contact with the os pedis, the shape of the new foot is normal, and, instead of the sole being flat, it is found to have taken on its normal arch.

To be certain of results, the grooving of the foot should be complete from heel to heel, usually about three-quarters of an inch to one inch from the coronary band, and should penetrate throughout its length down to sensitive tissue.

A certain amount of pain and lameness persists for a considerable time, but this is alleviated to some extent by putting the patient on a sawdust bed and by prohibiting exercise until the horse is obviously fit for it. In five or six months the new hoof should be complete, and it will be found that the horse, be he race-horse or troop horse, will have recovered his action. A race-horse which had lost his action from this condition in both fore feet, operated on recently placed second with top weight. The new hoofs are perfect in shape and function.—*Major C. M. Stewart, R.A.V.C.*, in *The Jnl. of the Roy. Army Vet. Corps*, Aldershot, England.

Pseudoleucemia in a Dairy Cow

By LLOYD B. MOBILEY, Kansas City, Kansas

UDALL defines leucemia as a disease occurring principally in cattle, characterized by hyperplasia of the leucoblastic tissues, with or without an increase of the leucocytes in the blood. It has been defined by Feldman and others as a malignant neoplasm, a hyperplasia of the blood-forming tissues of which the immature lymphocyte or its forerunner is the cell type. Because in some cases there is an increase in the number of leucocytes in the blood stream and in other cases there is a normal number, the nomenclature has been so set up as to indicate these differences. For practical purposes in most instances either type of this condition is considered as leucemia with no attempt at differentiation; more accurately, however, those cases in which there is an increase in the leucocytes in the blood along with the hyperplasia of the leucoblastic tissues are called leucemia, while those cases which show no increase in leucocytes in the blood are called pseudoleucemia.

Occurrence.—According to some investigators leucemia and pseudoleucemia occur most frequently in dogs, there being a few more cases of the former (Hutyra and Marek). Others (Udall) report that the disease is preëminently one of cattle, other animals, swine, sheep, and cats, being rarely affected. According to the records of the veterinary clinic of Kansas State College, leucemia and pseudoleucemia are of practically equal incidence in dogs and cattle.

Etiology.—The etiological factor or factors in leucemia and pseudoleucemia are cryptogenetic; some reports in the literature have indicated, however, that the etiological factor may be a bacterial toxin, while on the other hand the hyperplasia, evidence of metastasis, unrestricted growth, and destruction of tissue may warrant their classification as neoplasms. None of these probable causes having been proved, we must at present conclude that the etiological factor operating in these conditions is unknown.

Case Report

In most clinical cases nearly all the lymph glands of the body are enlarged, and those not normally visible become visible. Although there must be a differential diagnosis between leucemia and tuberculosis, the symptoms are not obscure, except in atypical cases. The case which the writer observed was one in which the clinical symptoms gave no suggestion of leucemia or pseudoleucemia, the animal showing principally marked abnormality of habitus and locomotion.

History.—The animal, a five-year-old Holstein dairy cow weighing 1100 pounds, was brought into the veterinary clinic at Kansas State College March 15, 1938. The history was one of slowly developing lameness and stiffening of the hind legs, with difficulty in rising and lying down. There was a slight decrease in appetite.

Examination.—The mucous membranes were normal, as was the temperature (102.2°F). The pulse and respirations were within the normal range and of normal character. Rumination was normal, as was the elimination of feces and urine.

Because of the involvement of the posterior parts, a rectal examination was indicated. It revealed a large, firm, lobulated mass of tissue, slightly smaller than a football and oval in shape, firmly attached to the bases of the lumbar vertebræ. The sexual apparatus was normal, the uterus being non-gravid. The iliac arteries could be felt pulsating rather strongly as they emerged from above the enlargement.

The difficulty in locomotion and the stiffness of the posterior limbs were accompanied by a peculiar position of these limbs. (See illustration.) The hocks were flexed about 20° more than normal. The fetlock and pastern joints were both flexed. The feet were held three or four inches apart and were farther forward under the body than normal, owing to the position of the limbs. The animal walked with difficulty, the relative position of the joints never changing. Examination of the feet revealed no abnormality.

The superficial lymph gland showed no enlargement and a laboratory count of the blood cells (as figures below will show) revealed a

normal number of erythrocytes and leucocytes per cubic millimeter, and normal relative numbers of leucocytes.

Diagnosis.—The enlargement palpated per rectum suggested that a neoplasm was interfering with the vessels and nerves supplying the posterior limbs. The pulsations of the iliac vessels and the location of the enlargement where it might interfere with or cause pressure on some of the branches going to compose the sciatic, checked affirmatively with this conclusion, and accounted for the condition and position of the limbs. Positive diagnosis was withheld, but prognosis was very unfavorable.

Development and Treatment.—The primary consideration in the case at this point was the diagnosis. Because of the development or discovery of the facts which made a diagnosis possible after the animal was under observation for several days it is considered advisable to include these facts as they were revealed, along with the discussion of the treatment and developments.

On the first day the animal was given a palliative treatment of 200cc of 25% glucose intravenously while further consideration of the diagnosis was made. A specimen of blood was taken from the jugular vein and sent to the laboratory for examination, with the following results:

TOTAL NUMBER OF CELLS PER C. M. OF BLOOD

	This Case	Normal
Erythrocytes	7,500,000	7,600,000
Leucocytes	6,000	5,970

DIFFERENTIAL COUNT OF LEUCOCYTES

	1st Day	2nd Day	Normal
Eosinophiles	7%		4.5%
Basophiles	1%		.86%
Neutrophiles (polymorphs)			33.0%
Mature forms	18%		
Immature, or transitional forms	11%		
Lymphocytes			58.4%
Large lymphocytes	45%	33%	
Small round lymphocytes	6%	8%	
Immature or transitional forms	7%	20%	
Monocytes	5%		

It may be seen from the table that the numbers of cells were normal. Particular attention should be directed to the differentiation made of the lymphocytes, for this differentiation proved to be significant in this case.

Because of the frequent incidence of actinomycosis in dairy cows in this section of the country the possibility of this disease was considered, and on the third day after another blood specimen was taken, the animal was given one ounce of sodium iodide in one pint of distilled water intravenously. In the event that the enlargement was due to actinomycosis, this treatment would be beneficial.

The laboratory examination of the blood taken on this day revealed no significant change except an increase in the number of immature or transitional forms of lymphocytes from 7% to 20%, though there was only a slight increase in the total number of lymphocytes. This change suggested some form of lymphocytic upset.

On the fifth day, the animal having been given the same sodium iodide treatment, the blood picture revealed that the percentage of immature lymphocytes had increased to 36, although there was still no significant increase in the total number of lymphocytes.

It is an accepted fact that there are two conditions in which there is an increase in the number of immature lymphocytes in the blood stream. They are:

1. An abnormal demand at some point in the body for leucocytes, in an effort to supply which the blood forming organs eliminate the cells before they are mature.

2. A pathological condition at the point of origin of lymphocytes resulting in the occurrence of many immature forms, some of which are liberated into the blood stream.

The consideration of these principles and the marked increase in the percentage of immature lymphocytes found in the blood of the animal gave additional strength to the possibility of a condition involving the lymphocyte-producing organs; further, the location of the enlargement where it could involve the sub-lumbar lymph glands was considered sufficient evidence to make a provisional diagnosis of pseudoleucemia.

The sodium iodide treatment was continued

another day, or until the case was pronounced incurable.

Post-Mortem Findings. — Permission was obtained from the owner to destroy the animal and conduct a post-mortem examination. The examination revealed no detectable changes other than the enlargement involving the sacral lymph glands. The enlargement was covered with loose fibrous connective tissue.

Portions of this tissue were sectioned. Microscopic examination of the section revealed enormous numbers of immature lymphocytes. A few of the lymphocytes were mature. The diagnosis was fixed as pseudoleucemia.

Conclusions

According to previous reports there is in pseudoleucemia no increase in the number of leucocytes in the blood stream. The observations in this case support this, but indicate that a progressive increase in the number of immature lymphocytes may be diagnostic of pseudoleucemia, in conditions where there is enlargement of lymph gland or of tissues that involve lymph glands.

The failure to make an early diagnosis of pseudoleucemia, as in the case here described, may result in prolonged and, because the disease is incurable, futile treatment. Such a mistake results in needless expense to the owner and often creates an undesirable situation between practitioner and client. An accurate method of diagnosis would eliminate this uncertainty. It would therefore appear that further investigation of the possibility of diagnosing pseudoleucemia by means of the differential leucocyte count should be undertaken, since this case strongly suggests that the increase in the percentage of immature lymphocytes may be a factor of regular occurrence in this somewhat obscure disease.

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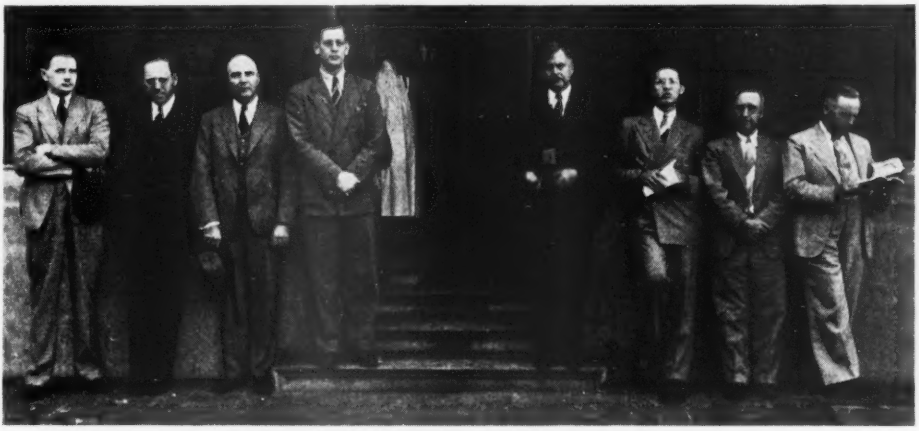

AMERICAN VETERINARIANS VISIT BELGIAN VETERINARY COLLEGE

Several American veterinarians, in Europe last summer for the purpose of attending the XIII International Veterinary Congress, visited l'Ecole de Médicine Vétérinaire in Brussels, Belgium, Aug. 16, 1938. They were most favorably impressed with the buildings and equipment of the college, and highly appreciative of the kindness of Dean (recteur-professeur) Van Goidsenhoven in showing them all about the institution and explaining the methods of instruction employed. As the visit occurred during the summer vacation, no students were at the College. Those shown in the illustration are: Lieut. W. W. Fechner, New Orleans, Drs. G. G. Graham, Kansas City, N. L. Nelson, Ames, Ia., R. O. Rydell, St. Paul, D. M. Campbell, Chicago; Mr. Wm. Graham, Kansas City; Drs. F. A. Wright, Moorestown, N. J., and J. X. Parent, Foley, Minn. The photograph was taken in front of the Administration Building of the College.

Causes of Sterility in Cows

By CARL F. SCHLOTTHAUER, Rochester, Minnesota,
Division of Experimental Medicine, The Mayo Foundation

THE term "sterility" commonly is used in veterinary literature to designate any condition of infertility or inability of a cow to deliver at term a normal viable fetus.

The economic importance of sterility of cows has long been recognized, but it was not until Albrechtsen in 1920 and Williams in 1921 published books on this subject that interest in this field of veterinary practice became general. My experience in this field began in the spring of 1923. Since then I have had the opportunity to study and treat many cases of sterility in several large herds of dairy cattle. In this paper, I plan to discuss briefly the diagnosis and treatment of some of the commoner causes of sterility of cows.

■ The causes of sterility are various. Age, physical condition, diet, environment and season of the year are important primary factors. Certain diseases cause sterility by affecting the genital tract directly or indirectly.

Bang's disease is undoubtedly the most important primary disease causing sterility in cattle. It commonly causes inflammation and necrosis of the cotyledons and placenta in pregnant animals. Various secondary lesions of the cervix, uterus and fallopian tubes are frequent. It may also cause inflammation of the genital tract of nonpregnant cows and heifers, and in infected herds, is a common cause of sterility in the latter.

When Bang's disease was eradicated from some herds, other causes of sterility became apparent. It is now generally recognized that deficient diets, environment, and numerous other factors are common causes of diseases of the ovaries and uterus. The parasitic organism *Trichomonas fœtus* is known to be present in many areas. Many investigators think that it is at present an important cause of sterility in some herds. I have had no experience with trichomoniasis and shall not discuss it.

Cervicitis is the most frequent specific lesion of the genital tract of cows observed by me. It may be present as a primary disease or it may be secondary to, or associated with, metritis, salpingitis or vaginitis. It commonly causes sterility by creating an unfavorable environment for the spermatozoa, or if the disease is slight and conception occurs, the presence of exudates, resulting from inflammation or hypertrophic cervical folds may prevent satisfactory closure of the cervix and abortion may occur later. It also is possible for the inflammation in the cervix to extend forward into the uterus and cause metritis.

Unilateral salpingitis and endometritis are perhaps next to cervicitis in frequency of occurrence. These lesions probably are a more frequent cause of nonspecific abortion in cows than is generally recognized. Fertilization and conception can occur in the nonaffected horn of the uterus. The disease process in the fallopian tube or the apex of the other horn of the uterus may later extend to the cotyledons and placenta. If the disease is severe it may result in abortion of the premature fetus, while if it is less severe it may cause only retention of the fetal membranes following delivery of the fetus at term.

■ Before attempting to diagnose the cause of sterility in a cow, one should when possible obtain a record of the breeding efficiency of the entire herd, including the sire, as well as that of each cow examined. This history frequently gives valuable clues to the cause of the sterility present. All pertinent information obtained should be entered as a permanent record of the case. I record these data on a card 10 by 15cm, 4 by 6 inches in size, bearing a printed form similar to that used by Lothe (fig. 1).

Farm..... Date.....

Name..... Date of Birth..... Number.....

Dates of Estrum and Service.												Pregnancy	Breeding Data		
Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Exam.	Date Due	Parturition	Result

History.....

Condition..... Lactation..... Estrum.....

Vulva..... Vagina.....

Cervix..... Uterus.....

R. Br. Lig..... Oviduct..... Ovary.....

L. Br. Lig..... Oviduct..... Ovary.....

Diagnosis..... Prognosis.....

Treatment applied.....

Treatment advised..... (OVER)

Fig. 1. Record card for case histories of sterile cows

After obtaining the preceding information, I make a gross examination of the genital tract and ovaries, proceeding as follows: The cow is confined in a stanchion and an assistant holds the tail up over the cow's back or to one side to expose her external genitals. The vulva and surrounding areas are first thoroughly cleansed with soap and water and then a glass speculum 41 to 46 cm (16 to 18 inches) in length and 3.8 to 4.1cm (1½ to 1⅝ inches) in diameter is carefully introduced into the vagina. The interior of the latter is illuminated by directing a beam of light from an ordinary pocket flash light through the entire length of the speculum into the vagina. A regular diagnostic light inserted into the speculum may be used but I usually find a flash light adequate. The vagina and cervix are inspected as the speculum progresses forward. The color and character of the mucosa of the vagina and cervix as well as the quantity and character of the secretions present are noted. It is important that the cervix be visualized before the speculum or even a breath of air touches it, because if one touches or manipulates the cervix directly or indirectly, it immediately becomes congested. This state of physiologic congestion may be confused with inflammation. The wall of the vagina should be smooth and pink in color. The normal cervix likewise is pink in color and appears as a symmetrical, smooth, slightly protruding annular fold. However, after one or more fetuses have passed through the cervix, it appears slightly irregular and hypertrophic. The cervical canal is approximately 8cm (3 inches) in length and is obstructed by interdigitating folds of mucosa, usually four in number, which make it appear tortuous. It normally is closed but it is relaxed during estrus and in the presence of disease of the cervix or uterus. Hypertrophied or swollen, protruding cervical folds, or rings as they are frequently termed, usually indicate previous or still-existent cervicitis. During pregnancy the cervix is closed and sealed by a firm tenacious mucous substance termed the cervical seal or plug. This can be both

Carl F. Schlotthauer

The great economic importance of sterility in cattle has led to many investigations of the various causes of this condition, in both bulls and cows. In this paper, which was read before the meeting of the Illinois Veterinary Conference, Urbana, Illinois, October 6 and 7, 1938, Doctor Schlotthauer discusses some of the commoner causes of sterility in cows, outlining the diagnostic procedures and the methods of treatment which he has found successful.

visualized and palpated. The secretions in the vagina should be clear mucus; the quantity present varies with the state of the estrual cycle.

After the vaginal examination the gloved hand is carefully introduced into the rectum. Not only will a thin rubber surgical glove protect the operator from soiling but it will also protect the rectum and vagina of the cow from injury due to sharp finger nails. If the rectum contains fecal matter, it should be evacuated before palpation and examination of the genital tract is attempted. For convenience, I examine the cervix first, then the uterus, fallopian tubes and ovaries. In aged cows, or if the uterus has been recently gravid or is diseased, the uterus and ligaments may be so relaxed that a satisfactory examination is not possible until a uterine forceps is placed on the cervix through the vagina and the uterus is drawn up toward the pelvis.

■ A thorough knowledge of the normal anatomy of the genital tract and ample opportunity to practice palpation of these organs is essential for a correct interpretation of findings revealed by examination. Fluid within the uterus may indicate pregnancy or pyometra. It is difficult to differentiate bicornual pregnancy from pyometritis by palpation of the uterus alone until after the fourth month of gestation. In such cases, the breeding history of the cow and examination of the cervix by means of a vaginal speculum are helpful. If the uterine enlargement is unilateral and a corpus luteum is present in the ovary on the affected side, pregnancy usually is the causative factor. One occasionally must differentiate between a living fetus and a dead or mummified fetus. In the latter condition there is an absence of fluid within the uterus and pulsation of the uterine arteries is much diminished. If the uterus feels essentially normal but visual examination of the cervix has indicated possible endometritis, I always pass a return-flow uterine catheter through the cervical canal into the uterus and irrigate the latter with a weak aqueous solution of iodine, using 30cc of compound solution of iodine in

Cystic ovary and uterus. The wall of the uterus has been incised to show its atonic character.—*Photo by Kingman*

3.8 liters (one gallon) of water. The solution returning through the catheter is observed for the presence of mucus, blood or pus. Blood may be due to trauma from the catheter, but pus in any form in the return flow indicates disease in the cervix or uterus. If it appears only in the first flow of fluid from the catheter, it probably was picked up by the catheter in the cervical canal, but if it continues to appear it must have its origin in the uterus. Thus this procedure has diagnostic as well as therapeutic value. The presence of blood in the return flow of fluid from the uterus may be due to injury from the catheter but it may also indicate that the mucosa of the cervix or uterus is inflamed and easily traumatized.

The fallopian tubes are carefully palpated to detect shortening, thickening, adhesions or other evidence of a preëxistent or present salpingitis. Because of the natural drainage of the fallopian tubes into the uterus, secondary endometritis and cervicitis are frequently associated with salpingitis. Severe inflammation of the fallopian tubes frequently causes complete permanent obstruction or obliteration of the lumen of the latter. This, however, cannot be definitely determined in the living animal.

As the ovaries are palpated, their size and character are noted to determine their physiologic state. Normal ovaries are slightly flattened and elongated; they may be 2cm or more in length and if they are physiologically active one should be able to palpate an ovisac or one or more corpora lutea in one or both ovaries. Normal ovisacs vary in size and must be differentiated from corpora lutea and true cysts. Normal corpora lutea must likewise be differentiated from so-called persistent corpora lutea. An accurate record of the number, frequency and dates of the estrual periods is helpful in differentiating physiologic from pathologic changes in the ovaries.

Cystic degeneration of an ovisac, a so-called follicular cyst, usually causes too frequent or continuous estrus, commonly termed nymphomania. Cystic degeneration of a corpus luteum, on the other hand, usually causes infrequent or irregular estrus. Both kinds of cysts may cause abortion in pregnant cows. Ovarian cysts vary greatly in size and they cannot be differentiated by palpation alone. For differentiation one must refer to the estrual history of the cow and her general physical condition. This is especially important when the cysts are small and must be differentiated from normal ovisacs and corpora lutea.

Atrophic or nonfunctioning ovaries do not cause specific symptoms other than an absence of estrus. This condition of the ovaries is the only one that can be quite definitely diagnosed by palpation alone. The cause of the absence of physiologic activity of the ovaries, however, is difficult to determine.

■ Treatment of the various conditions mentioned above must vary with the probable etiology, extent, duration and severity of the disease present. Therefore, no one method of treatment is applicable to all similar cases.

Cervicitis undoubtedly is the most frequent lesion of the genital tract observed by me. Before deciding on a method of treatment, I try to determine whether the lesion is primary in the cervix or secondary to some other disease. Primary cervicitis, if severe, is treated by irrigation of the cervix and uterus with a dilute solution of iodine. This is repeated once each week if indicated. If the disease is not too severe, that is, if there is no definite purulent discharge from the cervix, the cervix is first retracted by means of a uterine forceps attached to the margin of the external os. Then it is wiped with a dry swab to remove the mucus and exudate. Then compound solution of iodine (Lugol's solution), tincture of metaphen or 2% solution of mercurochrome is applied with a gauze swab. This is passed throughout the length of the cervical canal. All protruding, inflamed cervical folds, if present, are first excised using curved serrated scissors. If the cervix cannot be conveniently drawn back and exposed or the canal is too constricted to permit swabbing, I inject 2 to 5cc of compound solution of iodine directly into the cervical canal through a catheter attached to a glass syringe. The cervix should be examined through a speculum after one week and treatment repeated if necessary. Simple amputation of protruding cervical folds frequently is striking in its effect.

■ Endometritis is more frequent than pyometritis. Treatment of the former sometimes includes exercise and changes of diet as well as medication generally and locally. During the summer months when cows are permitted to graze and exercise liberally, treatment is always more successful than in the winter months. Undoubtedly, certain vitamins in the green food play an important role. For medication I irrigate the uterus with a warm aqueous solution of iodine, using 1 ounce (30cc) of compound solution of iodine in each gallon (3.8 liters) of water. This solution retains its antiseptic properties under varied conditions. To irrigate the uterus, I first apply a forceps on the cervix to retract and fix it and make passing of the uterine catheter easier. To do this, the gloved left hand is introduced into the vagina and the jaws of the forceps are directed onto the left side of the cervix, the handles being

manipulated by the right hand. When this has been accomplished the forceps is grasped near the cervix with the left hand and a catheter of suitable diameter is passed through the vagina and cervix into the body of the uterus. The catheter, likewise, is manipulated by the right hand. The left hand is then withdrawn from the vagina and is passed into the rectum to determine the exact situation of the tip of the catheter. It should be definitely located within the uterus before the tube from the irrigating bag is attached to the other end of the catheter. When the right hand has determined that everything is satisfactory, fluid from the irrigating bag is permitted to flow through the catheter into the uterus. After carefully observing the condition of the first return of fluid from the uterus, I usually place a finger over the opening of the return flow of the catheter to obstruct it and cause distention of the uterus. This may be repeated several times. If the uterus fails to contract and expel the fluid, traction is applied on the uterine forceps to elevate the uterus and the fluid is then removed by massage. When cervicitis is present and the cervix is relaxed, I usually plan to leave 60 to 90cc (2 to 3 oz.) of the iodine solution in the uterus. This will be discharged after the catheter is removed and make the swabbing of the cervical canal unnecessary. The above treatment should be repeated after one week if indicated.

Cases of pyometritis in which the uterus is distended with purulent fluid occasionally do not respond to irrigation of the uterus alone. I do not attempt to drain and irrigate the uterus in such cases. In many cases it is possible to cause spontaneous contraction of the uterus and expulsion of the fluid by expressing a functioning corpus luteum from an ovary. Cases presenting nonfunctioning ovaries and atony of the uterus are treated with a commercially prepared estrual hormone and pituitary extract. The former is given in 5 to 10cc doses. Twenty-four to 72 hours later, depending on the state of relaxation of the cervix, 5 to 10cc of pituitary extract is administered intravenously. This usually causes rather prompt and complete emptying of the uterus. Occasionally this treatment must be repeated after one or two weeks. As soon as the uterus remains in a contracted state, it may be irrigated and treated as in a case of endometritis. Cases that do not respond satisfactorily to the above treatment, frequently are successfully treated by instilling liquid paraffin, oil and boric acid into the uterus. The quantity will depend on the size of the uterus. Permanent sterility following severe pyometritis is frequent.

It is difficult definitely to diagnose the presence of salpingitis in the living cow. In those cases in which a diagnosis of salpingitis is made, its remote situation makes direct treatment impossible. Endometritis commonly is associated with inflammation of the fallopian tubes. Therefore, I treat suspected cases of salpingitis like cases of endometritis. If definite lesions can be palpated in one tube only and the ovary on the nonaffected side is not developing ovisacs, one can stimulate it into activity by removing the ovary and tube on the affected side. This operative treatment has proved successful in some cases treated by me.

■ So-called persistent functioning corpora lutea usually can be expressed by grasping the ovary through the rectal wall and exerting pressure on it. If the corpus luteum has been present for a long period of time, it may be firmly embedded in the ovary. In such cases it sometimes is unsafe to exert sufficient pressure on the ovary through the rectal wall to dislodge the corpus luteum. I then express it by grasping the involved ovary through the vaginal wall. This is accomplished by placing one hand in the vagina and the other in the rectum. The hand in the rectum can readily grasp the ovary, draw it back and place it in the other hand. To guard against hemorrhage from the ovary it is advisable to grasp the ovary and hold it tightly for two or three minutes following expression of the corpus luteum.

The etiology of cystic degeneration of a corpus luteum is different from that oc-

curring in an ovisac. The former is a unilateral, localized, pathologic process while the latter appears to be a manifestation of some disturbance of the endocrine system and may affect one ovary or both ovaries simultaneously.

As regards treatment, both kinds of cysts should be removed. It usually is possible to rupture cysts in the ovaries by grasping the affected ovary through the rectal or vaginal wall and exerting pressure on it. Occasionally a cyst cannot be ruptured in this manner. It then becomes necessary to incise or puncture it through the vaginal wall. This can be done with a knife or an aspirating needle. I prefer the latter. Merely rupturing a cystic corpus luteum usually is sufficient, but similar treatment of a follicular cyst commonly causes only transient relief. However, apparently permanent cures have been observed following this simple treatment of both kinds of ovarian cysts. Irrigation of the uterus usually is of little benefit in the treatment of cystic disease of the ovaries unless there is associated with it definite metritis. My present method of treating follicular cysts in the ovaries consists of first rupturing the cysts and then administering a commercially prepared extract of corpus luteum. I examine the cow the following week and repeat the treatment if necessary. Recovery usually is rapid.

■ Nonfunctioning ovaries are difficult to stimulate into activity in some cows. The age of the cow, duration of sterility, diet, environment and season of the year must all be given due consideration. In the absence of any obvious cause for sterility due to nonfunction of the ovaries, massage of the ovaries, irrigation and massage of the uterus and the subcutaneous administration of a commercially prepared estrual hormone have given satisfactory results in some cases. Oral administration of potassium iodide during the winter months appears to have a tonic effect on some cows. Age, diet and environment generally are the most important factors in sterility from this cause. The importance of diet and environment is illustrated in the following observation: Four cows and a bull were diagnosed as functionally sterile during the late winter months; gross lesions were absent. They were placed together in a pasture early in the summer and all treatment was discontinued. All four cows became pregnant within 90 days.

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The Drug-Prescription Racket

O. M. Gannett (*The American Mercury*, Nov., 1938) writes a timely article titled "The Drug-Prescription Racket," revealing the direction the wind is blowing in the medical supply department of the house of medicine. Everyone practicing medicine should read it. In its context, the veterinarian will find comfort in having continued to honor the doctrines of the materia medica, while the physician was allowing a billion-dollar outlet for home treatments to be developed by some of the makers of this material. Quoting: "The bid for the doctor's patronage is made in the old, magnificently uninhibited style of Lydia Pinkham. . . . With the poorly-explored realm of glandular products, drug companies abandon all shame and rush to cash in on the endocrine fad which has resulted in the grossest and most ridiculous quackery in the past millenium."

This is not a criticism of organo-, bio-, or chemotherapy but of the way these are being exploited to the detriment of the professional man and mankind. Happily, the worthwhile makers of the veterinarian's supplies consort only with the professional man and oppose as irrational the expansion of the home-treatment trend. They sell only to the qualified professional *in the role of pharmacist*, tell the whole story about their products to him, and strive to keep their output from channels of trade where users are lured to save doctor bills at the expense of their livestock.

Incidence of Trichomonas Foetus

INFECTION with *Trichomonas fœtus*, trichomoniasis of cattle, is a purely venereal disease as it occurs in outbreaks. Only a few calves and supposedly virgin heifers have been found to be infected. The disease is transmitted largely through infected breeding stock, either male or female. In this regard it would be interesting to know something of its incidence. Unfortunately exact information of this kind is not available. Mazzanti[1] is credited with discovering the disease in Italy in 1900. However, it remained for Riedmüller[3,4,5,6], Abelein[7] and others in Germany to rediscover it about 25 years later. Thus the disease is present in northern Italy, Switzerland; very common in parts of Germany (Abelein[7]); is found in the north of Europe (de Blieck and Bos[8]); France, England (Stableforth, Scorgie and Gould[2]); in the United States; and no doubt in many other parts of the world. In the United States it has been reported in Pennsylvania (Emmerson[9]); Iowa (McNutt, Walsh and Murray[10]); New York (Cameron, Fincher and Gilman[11]); Texas (Schmidt[12]); Wisconsin (Beach[13]); New Jersey (Hagenbuch[14]); Nebraska, Ohio, Utah (Madson[23]); Minnesota (Boyd[15]); and other localities (Andrews et al[16,17,18]). Trichomoniasis is most troublesome in southwest Germany where it is responsible for a majority of all breeding troubles (Abelein[7]); Küst[19,20]). In Hungary 39% of pyometra cases showed trichomonads (Meszaros[21]). There is less infection in other parts of Europe, especially the north. Only a few cases have been reported from England (Stableforth, Scorgie and Gould[2]) and none in Scandinavia[22]. In Europe the infection has been seen in certain cases of genital disease of both horses and swine, and also observed in the blood stream of cattle (Küst[20]). It appears, however, that trichomoniasis is primarily an infection of the genital tract of cattle. In the United States it is thought that there is little infection, but there is some evidence that there is more in some localities than in others. Judging from the number of reports it appears that there may be a little more infection in the eastern part of the country, less in the middlewest and still less farther west. It is not known to be extensively prevalent in any region.

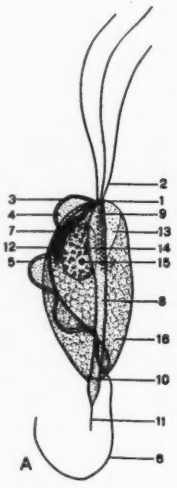

Fig. 1. A. Diagrammatic drawing of *Trichomonas foetus* (Riedmuller): (1) blepharoplast; (2) anterior flagella; (3) posterior flagellum as margin of the (4) undulating membrane; (5) accessory filament in the undulating membrane; (6) posterior free flagellum; (7) costa; (8) axostyle; (9) endoaxostylar granules in the capitulum of the axostyle; (10) chromatic ring about the axostyle at point of emergence from the body; (11) terminal spine of axostyle; (12) parabasal body; (13) cytostome; (14) nucleus; (15) caryosome; (16) undifferentiated cytoplasm. *From Wenrich and Emmerson, 1933.*

In order to roughly estimate the amount of infection in Iowa a partial survey has been made. A number of cows, heifers, sows and gilts have been examined at one of the central Iowa meat packing establishments. This establishment kills large numbers of hogs that are representative of Iowa hogs and goodly numbers of heifers and cows coming mostly from central Iowa. Examinations for trichomonads were made of the genital tract of animals soon after slaughter. The genital tract was removed. The vagina and uterus were opened and microscopic preparations made from the surface of the anterior third of the vagina and from the uterus, but especially from any part showing pathological changes. The microscopic preparations were all made and examined in the fresh state. Usually the addition of some fluid was necessary to obtain a uniform distribution of the material on the slides, to prevent drying, and

Infection in Iowa

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to dilute the material. For this 0.85% sodium chloride solution or fluid from the uterus was used. The preparations were examined immediately, before appreciable drying could take place. Where no lesions of either the vagina or uterus were encountered, only one preparation taken from the vagina a few inches from the cervix was examined. Where lesions were found, smears were repeatedly made from the various parts. A total of 641 cows and heifers have been examined as follows:

TRICHOMONAS FREE ANIMALS

Cows	*Heifers*
196 pregnant	120 normal, pregnant
93 normal, non-pregnant	192 normal,non-pregnant
5 vaginitis, non-pregnant	6 vaginitis, non-pregnant
6 pyometra	2 pyometra
3 cervicitis, non-pregnant	3 cervicitis, non-pregnant
5 metritis	5 spayed
1 abortion	

TRICHOMONAS INFECTED ANIMALS

Cows	*Heifers*
None	1 vaginitis, pregnant
	3 vaginitis, non-pregnant

It was found that the four infected animals came from the same farm. It was estimated that the total number of animals examined came from at least 250 farms. The infected animals showed trichomonads in the vagina only. The pregnant infected heifer was near the fourth week of gestation. All showed vaginitis. The anterior part of the vaginal mucosa was slightly reddened and showed many small elevated nodules up to the size of the head of a common pin or a little larger. These were yellowish-red and barely perceptible to the touch. They appeared much like the small lesions of granular vaginitis. On section the nodules were shown to be small areas infiltrated with cells which appeared to be largely lymphocytic. Aside from the four infected heifers, only one aged cow had similar vaginal lesions but no trichomonads were found in this animal although many preparations were examined. One sometimes fails to find trichomonads in known infected animals; however, lesions are usually observed in such individuals. For this and other reasons it is believed that very few or no infected animals escaped identification. Of eight animals affected with pyometra, none showed trichomonads. This is in contrast to 39% found by Meszaros[21] in Hungary. All six animals with cervicitis and the five with metritis were also free of trichomonad infection. Twenty-six per cent of the animals showing vaginitis were infected, 0.6% of the total cattle examined were infected and an estimated 0.4% of farms represented were infected.

Of recent years the tendency has become rather common to attribute to trichomonads infectious breeding difficulties in cattle not due to brucella infection. A survey by McNutt, Blohm and Barger indicates that this assumption is not justified, at least not in Iowa, where they find trichomoniasis in cattle to be rare. The observation of Schlotthauer, given elsewhere in this issue, supports this view.

An opposing view is that of Dr. C. H. Case of Akron, Ohio, who finds trichomonad infection of cattle very common in his extensive practice. He finds that mucus scraped from the tongue of an aborted fetus, or from a new-born calf, after incubation at room temperature for two to four days, will reveal numerous *T. foetus* in a surprising number of cases where upon the most patient search vaginal scrapings from the dams are negative. The dams of such calves, although they may breed normally and appear in perfect health, can infect other cows, and also bulls to which they are bred.

This partial survey is in no way complete. Experience indicates that there is less trichomoniasis in cattle than the figures denote. This is true because a careful watch has been kept during the last six years to identify trichomoniasis in herds having breeding troubles not due to Bang's disease. At least 75 such herds have been carefully examined and with the exception of six all have been found to be free of trichomoniasis. To these one might add all those herds in which there is no serious breeding trouble where no examination is asked or necessary and the number of trichomonad infected herds may be assumed to be small. Examination of Bang's disease free herds throughout this region has shown that other conditions and not trichomoniasis are responsible for the great majority of breeding troubles. The point is that Bang's disease causes much trouble in reproduction, but even where this is not a factor there still remains a considerable number of herds with serious breeding troubles. Only about 10% of these cases are due to trichomonads. The remaining 90% are caused by other factors, some of which are not yet known. Of course, these conditions occur in every combination so that herds having poor breeding records are very often affected with more than one disease. Of the six trichomonad-infected herds observed, two were affected with trichomonads only, one had Bang's disease also, one had at least two other breeding diseases, and the status of two in this regard is unknown.

No hogs infected with trichomonads were found. A total of 289 sows and gilts were examined. Vaginitis was found in 36 of these, but the condition was not caused by trichomonads in any instance. It would seem that infection in animals other than cattle is more or less accidental. In such regions as southern Germany where there is much bovine trichomoniasis one might expect to find an occasional infected sow, mare or ewe.

Conclusions

Examinations of cows and heifers at the time of slaughter, together with examinations of herds throughout the region during the past six years indicates that trichomoniasis occurs in not more than 0.5% of our herds, and there is evidence that this figure is too high.

Six infected herds have been found in Iowa. Four of these are now known to be free. No information is available on the other two.

Trichomonas fœtus infection was not found in hogs.

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Transmission of Bovine Venereal Trichomoniasis Through Artificial Insemination*

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ARTIFICIAL insemination has been proposed by Küst (1936), Fuchs (1935), and others, as a means of controlling bovine venereal trichomoniasis. The data presented by these authors show that cattle with trichomoniasis had a much higher birth rate following artificial insemination than following sexual intercourse, and that the calf crop was maintained by artificial insemination (even during periods of "sexual quarantine") while cows were under treatment. However, it was not stated whether the bulls from which semen was obtained were free of trichomonads. In the present paper data are presented to show that trichomoniasis may be transmitted when semen for artificial insemination is obtained from infected bulls. The observations on which the following report is based were made on a dairy herd near Beltsville, Md.

■ The first case was that of a 3-year-old cow that had borne one normal calf; this animal had been found negative for *Trichomonas fœtus* on seven examinations made at various times between the age of one year and the birth of the calf. Between the date of calving on August 18, 1937, and that of the first attempt at artificial insemination on February 12, 1938, the cow had not been bred. On the latter date semen was obtained by the method of rectal massage, as described by Miller and Evans (1934), from a bull that was known to be infected; five of 10 preputial examinations of this bull having been positive for *T. fœtus*. A microscopic examination showed that the semen contained a rather large number of actively motile spermatozoa. Immediately after collection, using a vaginal speculum and a glass pipette attached to a Luer syringe, the semen was injected into the cervix uteri of the cow at the time of heat. The cow did not conceive and was, therefore, again inseminated on March 16, and again on April 2, with semen from the same bull. From the date of the first attempt at artificial insemination, February 12, until August 30, 1938, the cow was in quarantine and vaginal examinations were not made. However, on the latter date this cow was slaughtered because of apparent sterility and found not pregnant. The uterus and ovaries appeared to be normal; however, on culture *T. fœtus* was found in the vagina but not in the uterus. These facts appear to indicate that *T. fœtus* infection in this animal was transmitted by artificial insemination.

■ The second case was of another 3-year-old cow that had borne two normal calves. From March 9, 1938, the date of the last

Artificial insemination is widely employed by animal breeders in Europe, where it is regarded as highly efficient and economical, as well as important as a means of controlling disease. Its operation is controlled and executed exclusively by the veterinary profession in the various major countries of Europe. In the United States, artificial insemination of animals has been but little used heretofore, but there is much interest in the subject and it gives promise of increasing. However, cattle breeders have not seen the wisdom of placing it in charge of veterinarians. This paper, which shows how easily one of the important diseases of breeding animals may be transmitted by artificial insemination, is a warning of the disease hazards that the method entails in inexpert hands.

*The work reported in this paper was carried out at the National Agricultural Research Center, Beltsville, Md.

calf, to August 7, 1938, the cow had not been bred and two examinations of vaginal material were negative. On August 17, 1938, a sample of semen was obtained from the same bull as mentioned above and inoculated into the cervix uteri of the cow that was in heat at the time. On September 1, 1938, 15 days after artificial insemination, the cow was found to be infected with *T. fœtus*, and at the present time, (September 9) is still positive. It appears, therefore, that in this case also *T. fœtus* was transmitted by artificial insemination.

The data of the present paper show that in two cases *T. fœtus* was probably transmitted by artificial insemination. In view of this, infected bulls should not be used as sources of semen for artificial insemination.

Veterinary Medicine One Hundred Fifty Years Ago

It is a truth generally acknowledged and universally lamented, that amidst all the improvements of the present age, none has received so little advantage from the rays of refinement as the art of farriery. And it must be likewise confessed, it is an ill compliment to a country abounding with sportsmen, and those remarkable for their extreme liberality, that members of the different learned societies should be absorbed in abstruse contemplations and intense lucubrations upon the antiquity of a coin, the proboscis of an elephant, the genus of an exotic, or the beautiful variegations of a butterfly; whilst a branch of science and study, involving the health, safety and preservation, of the most beautiful and esteemed animal this kingdom has to boast, is neglected as derogatory to the dignity of a man of letters: and, from this mistaken idea of degradation, a subject of so much consequence has been for many years submitted to the arbitrary dictation of the most illiterate parts of the community, without a single effort of weight or influence to abolish the ancient and almost obsolete mode of practice; or a single attempt made, from proper authority, to introduce the modern improvements and discoveries in every branch of medicine. It is most certain there is no one period of history where the horse has been so esteemed as in the present age.—*Wm. Taplin,* London, 1788.

Veterinary Research and Expansion of Animal Industry

Thirty years ago the Veterinary Research Institute at Onderstepoort, near Pretoria, was established under the direction of the late Sir Arnold Theiler. That institute has brought untold benefits to the farmers of South Africa, and has been responsible, more than any other single factor, for the rapid expansion of the animal industry in the Union. There is no animal disease of importance and no major problem connected with the health of animals which has not been investigated at Onderstepoort. If today, the authorities should suggest closing down Onderstepoort there would be consternation among the stock farmers of South Africa.—*P. J. du Toit.*

The Veterinary Profession a Humane Organization

As was stressed by Youatt in *The Veterinarian* a full century ago, the veterinary profession is essentially a humane, no less than a utilitarian, profession. To the grievous detriment of our private practitioners, we regret to think that a contrary impression is widely prevalent in the public mind, and at the present time veterinarians have often to suffer in their work from the activities of organizations, well-meaning and sincere without doubt, whose avowed object is the dispensation to animals of humane treatment which they consider these animals would not otherwise receive. The only humane treatment of the suffering animal, as of suffering mankind, is that which comes from the bestowal of the highest possible available skill, and to administer treatment with this degree of skill the only services that are to be depended upon are those of the fully trained veterinarian.—Editorial in the *Vet. Rec.,* 50:44.

Notwithstanding sheep are among the oldest of domesticated animals, their origin is as much of a mystery as who started the World War. We do not even know the etymology of the word "sheep".

Since the days of Abraham and of the shepherds with their little flocks on the Chaldean Hills, there have been no change in the habits of domestic sheep.

In restraining sheep have the owner or keeper catch and hold the animal if that is practical. Do not "grab" a sheep by the wool, as this may cause a serious bruise. In catching a sheep place one hand around the brisket and the other around the hind leg.

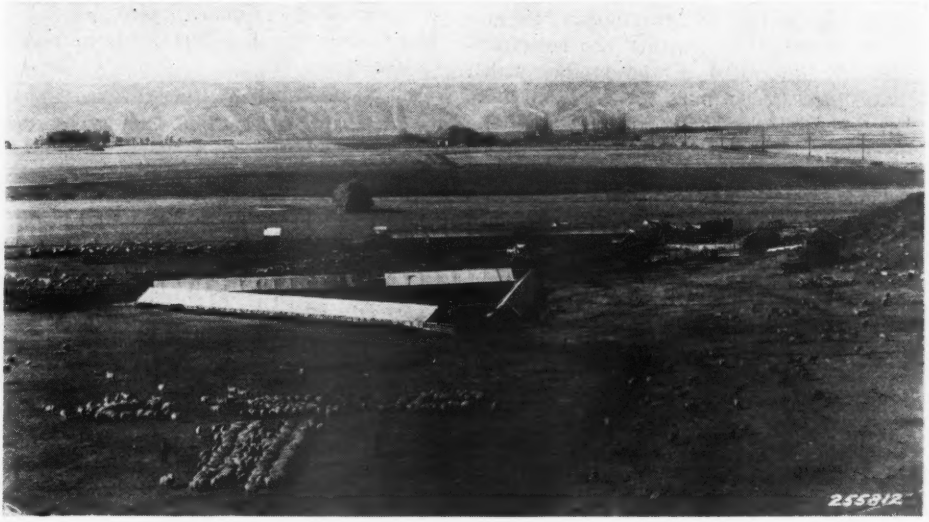
Sheep were brought to the New World by the early colonists, but it was not until 1801 that the industry assumed an important place in this country.

The first "panic" in the United States was partly precipitated by a sharp decline in the price of sheep and wool following the War of 1812. This was in 1816, and was disastrous for the young republic.

By 1840, sheep were an integral part of American agriculture and sheep raising flourished in all the states east of the Mississippi river. Following the Civil War, with the movement of hordes of land seekers westward, the Rocky Mountain region quickly became a favorite sheep country, and has so continued ever since.

Orphan Lambs are commonly called "bum lambs" in the western range country. If possible, place the orphan lamb with another ewe. Otherwise, feed a little warmed rich milk four or five times daily. A little corn sirup and lime water added to one feeding a day is often beneficial. Keep the animal hungry. Over feeding kills more orphan lambs than starvation. Give water frequently.

A thousand years ago, the Moors introduced sheep into Spain, and for many centuries no Spanish merinos were allowed to be taken from that country. The penalty for smuggling sheep across the borders was death, and many a Spanish widow married the hired man when her husband failed to come back after crossing the frontier in the dark of the moon.



Lambing sheds on an Idaho Ranch

Variation in Numbers of Coccidia in Lambs During the Feeding Season

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COCCIDIOSIS in sheep or lambs has been reported by Curtice (1892), Martin (1923), Newsom and Cross (1925, 1930, 1931), Jungherr and Welch (1927), and others.

During the last nine years (1929 to 1937 inclusive) 45 outbreaks of coccidiosis have been reported to or investigated by the Pathology section of the Colorado Experiment Station. This section has been particularly interested in the factors which have been responsible for coccidial outbreaks in lambs when brought into the feedlots.

Newsom and Cross (1931) reported some cases of coccidiosis starting within a few days after the arrival of the lambs in the feedlots. However, most of the cases studied have occurred between two and three weeks after the lambs arrived.

Chart I graphically illustrates the time elapsing between the arrival of the lambs in the feedlots and the development of coccidiosis.

■ The epidemiology of coccidial infection has been a matter of doubt. There has been some question whether the old feedlots were contaminated or whether the lambs carried the coccidia upon arrival. Previous studies at this station (1937) have shown that fecal samples from lambs upon arrival contained some coccidia. A continuation of that study was made on three lots of lambs this year. The fecal samples were taken in from one to four days after their arrival. In each instance coccidia were found, but in varying numbers.

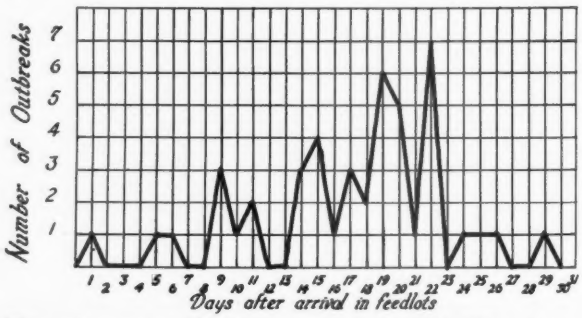
This corroborates our observations that in making fecal examinations of pens of lambs or flocks of adult sheep in this area, some coccidia have invariably been found. Marsh (1938) reported this finding in sheep and lambs in Montana.

■ To determine the relative number of coccidia in the feces of feeder lambs at intervals during the feeding season, three lots of lambs were selected for study during 1937-38.

At intervals, given in Table I, four fecal samples were collected from each lot. Each sample was a composite of feces obtained from four or more lambs. These specimens were prepared for microscopic examination by Sheather's technique as modified by Benbrook (1929). Numbers were recorded as being none, very few, few, fairly numerous or numerous.

While it is evident that this method of estimating and recording numbers of coc-

CHART I
Incidence of Coccidial Outbreaks as Related to Time in the Feedlots



This graph represents 45 outbreaks occurring from 1929-1937 inclusive.

cidia is subject to criticism, it is well to state that the same technician prepared all fecal samples in a uniform manner, and one of us (A.W.D.) made all the microscopic examinations.

constitute the period during which coccidiosis may develop. Even in these lambs which were kept under ideal conditions, coccidia became sufficiently numerous to approach the danger point.

TABLE I

Date of exam.	Lot I, 616 lambs Av. wt., 78 lb. Shipped 10-5-37 Unloaded 10-8-37 Sample number				Lot II, 606 lambs Av. wt., 57 lb. Shipped 10-16-37 Unloaded 10-18-37 Sample number				Lot III, 1214 lambs Av. wt., 71.1 lb. Shipped 10-28-37 Unloaded 10-31-37 Sample number			
	1	2	3	4	1	2	3	4	1	2	3	4
10-11-37	–	++	++	+								
10-26-37	+++	++	+++	++	+	++	++	+				
11-2-37	++	++	++	++++	++	++++	++		++	+	++	++
11-8-37	++++	++++	++	++	++	++++	+++	++	++	++	++	++
11-15-37					+++	++	+++	+++	+++	++	++	++
11-22-37	++	++	++	++	+++	+++	+++	+++	++	++	++	++
12-8-37	++	++	+	++	++	+	+	++	+	+	++	+
12-20-37	++	++	++	++	+	+	+	+	++	+	–	+
1-7-38					+	+	+	+	+	+	+	+
1-21-38		Lambs sent			+	+	+	+	+	+	+	+
2-17-38		to market			+	+	+	+	+	+	+	+
3-17-38					+	+	+	+	+	–	–	+

– = none; + = very few; ++ = few; +++ = fairly numerous; and ++++ = numerous.

It is believed that the results listed in Table I have some significance. Individual fecal examinations of lambs from other feedlots in this area gave results similar to those listed.

Discussion

The examinations have shown that in all lots of lambs which have been under observation, there has been a gradual rise in number of coccidia for at least one or two weeks. In most lambs the number of coccidia then became stationary for a period of about three weeks, following which a fairly rapid decline was noted.

The groups of lambs which were under observation this year (Table I) were grazed during the day and were not too closely confined at night. Their pens were always deeply bedded with straw. By this method of care the lambs were not exposed to a heavy infection from their own droppings. In addition, these lambs were fed a comparatively light ration consisting largely of oats and first-cutting alfalfa hay during the first month. The first month seems to

In all those lots in which coccidiosis developed, the lambs were closely confined and some were improperly bedded, while a majority of them were being fed a heavy ration during this period.

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Sheep Vermicide—A Stabilized Concentrate*

By E. R. CARLSON, Madison, Wisconsin,
Department of Veterinary Science, University of Wisconsin

THE use of copper sulphate and nicotine sulphate in combination as a sheep vermicide has been advocated for many years. Having used a 1% solution of copper sulphate and nicotine sulphate for many years as the routine vermicide in the University sheep flock when the flock was located upon the Station premises, the problem of the bulkiness of the drench was not much of a factor. However, with the movement of the sheep flock to new quarters located a few miles distant, the transportation of the prepared drench for several hundred sheep became cumbersome.

These clinical requirements suggested to the writer the possibilities of preparing the vermicide in a concentrated form to facilitate transportation and handling, with the assurance of a correctly made product prepared at the Station Veterinary Science Laboratory where facilities are available to make the concentrate.

In the regular method of preparing nicotine sulphate and copper sulphate there is precipitation, and frequent shaking of the solution is necessary during the drenching procedure. In making the concentrate this was considered, and a product was developed that has been shown to remain stable during a period of two years' observation. The stability of the solution assures accurate dose potency. No precipitation occurs when the vermicide is diluted for drenching.

Stabilization of the drench as described does not in any way chemically affect the constituents of the drench. Stabilization is produced mechanically, and not chemically, by the use of a protective colloid, gum arabic, which prevents precipitation. Gum arabic is a harmless gum readily taken care of by the digestive tract, and only the minute amount of 0.15% is required to render the drench stable.

* Contribution from the Department of Veterinary Science, Wisconsin Agricultural Experiment Station, published with the approval of the Director of the Wisconsin Agricultural Experiment Station.

Preparation of Concentrate

The following method describes the preparation of six liters of the stabilized concentrate, which is sufficient to make 72 liters of the drench containing 1% copper sulphate and 1% nicotine sulphate.

Distilled water	5280cc
Gum arabic	108gm
Copper sulphate	720gm
Nicotine sulphate	720cc

To three liters of distilled water add 108 grams of pulverized, high-grade, white gum arabic pearls and allow to dissolve thoroughly.

In the remainder of the distilled water (2280cc) dissolve 720 grams of copper sulphate.

When these two solutions are ready combine them by adding the copper sulphate solution slowly to the gum arabic solution, mixing thoroughly during the procedure.

To the prepared gum arabic-copper sulphate solution add 720cc of nicotine sulphate and mix thoroughly.

500 CUBIC CENTIMETERS
CONCENTRATED
To be diluted before using

SHEEP VERMICIDE
(CARLSON)

POISON

A stabilized solution of copper sulphate and nicotine sulphate.

DILUTION DIRECTIONS

Add the contents of this bottle to eleven (11) equivalent volumes of water to make a total volume of 6,000cc. (6 liters). This total volume will contain 1% copper sulphate and 1% nicotine sulphate. This amount constitutes 50 doses for mature sheep.

DOSAGE

Lambs up to 40 lbs.	¾ ounce
Lambs 40 to 60 lbs.	1 ounce
Lambs 60 to 80 lbs.	1½ to 2 ounces
Yearlings	2½ to 3 ounces
Large Adult Sheep	3½ to 4 ounces

POISON

DO NOT REPEAT
IN LESS THAN 21 DAYS

Bottling

The six liters of stabilized concentrate of nicotine sulphate and copper sulphate solution when prepared are put up in 500cc bottles. It is very important that these bottles be properly labeled. The label should give explicit directions for diluting the concentrate for use as a drench. It is also desirable to have dosage directions on the label. A reproduction (reduced) of the label which the writer uses with this product appears on the preceding page.

It will be noted that each 500cc of the concentrate will make six liters of drenching fluid. Six liters of drenching fluid will be sufficient to drench 50 mature sheep. This volume is convenient with the six-liter bottle used in our automatic drenching outfit. One 500cc bottle of the concentrate is added to the six-liter bottle, which is then filled to the six-liter mark with water, and the drench is ready for use. It is obvious that the amounts of concentrate and water can be reduced if fewer sheep are to be drenched. If only 25 mature sheep doses are needed, only 250cc or half the bottle of concentrate are needed, and to this volume of concentrate sufficient water is added to make three liters of drenching fluid. This flexibility of preparation of the drenching solution has been found very convenient.

Through the coöperation of Professor A. E. Darlow of the Animal Husbandry Department, over 1000 sheep drenchings have been made with this product. No losses or ill after-effects occurred, such as were sometimes experienced previously with the regular preparation of copper sulphate and nicotine sulphate drench.

Summary

A method for preparing a stabilized concentrate of copper sulphate and nicotine sulphate with the use of the protective colloid, gum arabic, is presented. The stability of the solution assures accurate dose potency. No precipitation occurs either in the concentrate or in the prepared drenching fluid. The stabilized concentrate can be stored or easily transported, and by diluting it as described, the preparation of the proper amount of drenching fluid for the flock is facilitated.

MEDICATION OF SHEEP

Demonstration of a simple method of dosing sheep at the 19th Illinois Veterinary Conference, University of Illinois, Oct. 5, 6, 7, 1938. By this method only an ordinary, rubber bulb dose syringe is used. Aspiration of the medicament is wholly prevented by merely closing the nostrils with the left hand while making the injection well back into the mouth. No other precaution is taken. The medicament up to two ounces is injected all at one time and the animal immediately released.

* * * *

Ten years ago the number of pelts sold by fur farmers or ranchers was insignificant. This year, about 300,000 silver fox pelts and 200,000 mink pelts will be sold from animals raised in wire pens or cages.

* * * *

Sulfanilamide, prontosil and related products are credited with 14 major victories over disease. Although this long known chemical was introduced to medicine only three years ago its record of cures already includes: Puerperal septicemia, due to the hemolytic streptococcus (80%); septic sore throat; streptococcic meningitis (50%); scarlet fever; septicemia; gonorrhea (acute 75%, chronic 99%); type III pneumonia; undulant fever; gas gangrene; lymphogranuloma inguinale, and others.

Disaster from Swine Disease Spread by Community Sale

The following is a brief description of a swine malady that was distributed over an area of some 20 miles square in South Central Missouri. This condition was more or less prevalent from October 1937 to September 1938. Pigs from a community sale were thought to be a factor in the source of this malady. It is estimated that approximately 1000 hogs succumbed in the fall of 1937. The losses have been greater during 1938.

The sanitary conditions on the farms where losses occurred were about average. This area is somewhat hilly. The soil is rather sandy thus drainage is quite good. Water is supplied largely by springs. On several farms visited, there was a notable absence of mud holes and hog wallows. There was nothing unusual about the feed and feeding of swine in this community. Cholera immune and cholera susceptible hogs were equally susceptible to this malady. The use of erysipelas serum was of no value. Hence, erysipelas can be eliminated.

The incidence of the disease in an affected herd was high and the mortality in affected animals was practically 100%. On one farm visited, there were approximately 100 hogs in the beginning of the outbreak and all except 11 had died. Several different farms were inspected and not a hog was found that had recovered from this malady.

Symptoms.—The first evidence of disease is diminishing appetite and in the course of three or four days, the affected swine refuse all feed. In the early stages, the temperature ranges from 106° to 108° F. By the third or fourth day, there is disturbed locomotion involving the hind legs first, then, the front legs. The affected animal goes down and dies within from eight to 14 days after the onset. All affected animals show difficult breathing. In many cases there is a limited nasal discharge and the nasal mucosa is swollen. Some cases are constipated, others have diarrhea. Sensitiveness of the skin may or may not be present.

Autopsy findings.—Occasional hemorrhages may be noted in the kidneys. In some cases there is a congestion of the mucosa of the stomach and small intestines.

Treatment has been of no avail, the mortality being as stated practically 100%. —*C. C. F.*, Mo.

Is the malady described, bulbar paralysis (Aujeszky's disease?). Comments from readers of VETERINARY MEDICINE will be welcome.—*A. T. K.*

Otitis Media in Young Shotes

I am seeking assistance in the diagnosis on some pig trouble that has had me puzzled for about a month. I am unable to arrive at any definite conclusion. There were 85 head of good pigs from spotted Poland China sows and a Hampshire boar in this herd. When they were about six weeks old and still with the sows, two of them started holding their heads twisted over until both ears were nearly in a vertical line and moving in a circle toward the downward ear. They continue this until they go down and are unable to rise. They struggle on the ground for a day or two, then die.

The temperature of all ailing pigs is normal. They are eager to eat until they can no longer find the trough. They are fed ground oats, shorts slop and shelled corn and have access to plenty of fresh water. It seems to be the larger and more thrifty pigs that are affected. They weigh about 50 to 60 pounds now. I made a post-mortem examination on five of these pigs shortly after death and killed one and found a full stomach in all of them and no sign of any abnormal condition, not even any parasites.

The owner reported today that another one started turning its head sidewise and circling this morning. I can find nothing wrong with these pigs. There is no bowel disturbance and everything seems normal except the head. They were running in the same blue grass pasture where they were farrowed in portable houses. I had them taken out of this pasture and weaned and vaccinated with serum and virus a week later.

On Nov. 10th, when they were treated,

12 had died and eight have died since, and all show exactly the same symptoms. There is some skin eruption on a few of them but even they are good looking thrifty pigs.—J. S. C., Iowa.

Comment: The symptoms you describe are typical of otitis media in pigs. When only one ear is affected the head is tilted to one side with the affected ear downward. In very severe cases the animal may walk in a circle with the affected ear toward the inside of the circle.

Treatment is most effective in the early stages of the disease or while the inflammation is confined to the eustachian tube and middle ear. In most cases a permanent cure can be affected. The tympanic membrane should be punctured with a long slender instrument. An otitis media probe may be obtained from firms handling veterinary instruments. Before puncturing the tympanum it should be anesthetized. A useful preparation for this anesthesia consists of equal parts of cocaine crystals, menthol crystals and phenol crystals mixed and allowed to stand until a syrupy solution is formed.

The instrument is passed down the external auditory canal to the tympanum which offers a characteristic resistance. Slight pressure is required to puncture it. Following puncture of eardrum an antiseptic solution should be used to irrigate the ear. During the irrigation it is well to lower the head and nostrils to provide better drainage. A two-ounce dose syringe with the slender nozzle is used to inject the antiseptic solution into the ear. The preparation B-i-p-p is probably the best antiseptic for this purpose. It consists of iodoform two ounces, bismuth subnitrate one ounce and mineral oil enough to make it the right consistency to inject. It may be necessary to use considerable pressure before the solution passes out through the nostrils. As soon as drainage is established through the nostril, treatment may be discontinued.—*E. R. E.*, Kans.

* * * *

Birds, particularly starlings, are suspected of having brought foot-and-mouth disease into England.—*S. N. L.*, 33:3.

Unusual Loss of Pigs

A client of mine has a few registered, Poland China sows. About ten days ago one of the sows farrowed 11 healthy pigs that were quite thrifty for about 48 hours. At this time some appeared droopy and in 10 hours the entire litter was dead. A few days later, a second sow farrowed nine pigs. Thirty hours later I was called to examine the litter. All of the pigs were still alive but five of them were quite droopy. In fact, two could scarcely walk. They were cold and in a few hours were in a comatose condition. The mucous membranes were icteric and anemic.

The five that were sick died. The remaining four were removed from the sow and placed on cows' milk and are doing nicely.

The pigs ran a course that is quite similar to a condition that I have found in young puppies when the bitches' udder becomes "caked" and inflamed.

The sows are normal and being fed a ration of corn, shorts and Purina pig conditioner and running on clover pasture.

I shall appreciate any information you can give me in regard to the diet of the sow and care of the pigs.—*R. H. G.*, Okla.

Comment: There are two conditions that probably enter into this malady. First, there may have been agalactia, a cessation of milk flow due to some dysfunction and not associated with any inflammatory process. Second, and I think much more probable, there was some mastitis which may not have been extensive, however, I believe you would have recognized it by careful examination.

Inflamed udders may or may not produce any milk, or there may be milk mixed with blood, blood serum and pus and these inflammatory products were probably responsible for the loss of these pigs.

The treatment of mammitis in sows is practically the same as in other animals. If the attack is acute it may subside without leaving the sow materially damaged. If it becomes chronic it will diminish the milk flow permanently and thus ruin the sow as a good breeding animal.

Some practitioners have apparently been

quite successful in the treatment of agalactia with glucose. Pituitary extract (anterior lobe) is, according to many practitioners, highly effective in the treatment of agalactia in sows.

After the udder disorders are corrected, sow's milk will be the best diet for the pigs. Until the udder ailments are corrected, substitution of cows' milk will probably solve the problem.—*A. T. K.*

Swine Erysipelas Spreads

The causative microbe of swine erysipelas was first identified in this country by Theobald Smith in 1886. The clinical evidence of swine erysipelas was recognized as diamond skin disease by Creech in 1921. The acute type of swine erysipelas was recognized in South Dakota in 1929, and since that time it has spread rapidly.

The value of effective regulations in the control of swine erysipelas was early recognized as is indicated by the following statement:

"This disease is of sufficient importance that definite rules and regulations should be instituted by state regulatory officials, to prevent spread and dissemination of the disease. Numerous instances of the occurrence of swine erysipelas in herds in Missouri, Iowa, Nebraska and Kansas, have been traced to shipments of swine from infected areas in other states. Swine erysipelas is far more difficult to control than hog cholera; since the infection persists on a farm that once becomes infected for an indefinite period."

So far as we are able to find in the available literature, the Texas Livestock Sanitary Commissioner was the first regulatory official to quarantine a county because of the prevalence of swine erysipelas. Neuces County, Texas, was placed under quarantine on March 5th, 1938. The county quarantine was lifted on August 15, 1938, but a quarantine was placed on eight premises until they are cleaned and disinfected and diseased swine are disposed of properly.—A. T. K.

Question Box—New Mexico Meeting 1938

Question: Which of the domesticated animals are susceptible to pseudorabies (Aujeszky's disease)?

Answer: Swine, sheep, goats, cattle, dogs, cats, rabbits and horses are susceptible to this malady.

Question: Will a cow drink salt water if fresh water is available?

Answer: Cows prefer fresh water and if normal and healthy, they will search for fresh water before drinking salt water.

Question: What is the highest percentage of salt water that a cow will drink when fresh water is not available?

Answer: Cows will drink water containing from 1.5% to 1.7% salt, but they soon become unthrifty.

Question: Will cows and bulls make a complete recovery from trichomoniasis infection?

Answer: If cows are not bred for several months they apparently recover. Several investigators are of the opinion that bulls once infected are always dangerous.

Question: Is Rabies-virus eliminated in the milk of a rabid cow?

Answer: Some investigators claim to have demonstrated rabies virus in the milk of rabid cows, however, in cows having rabies there is practically a cessation of milk and thus there is little or no danger of infection from milk.

Question: What are the typical successive changes in the lesion of swine-pox?

Answer: The lesions usually occur on the venter surface of the abdomen and inner surfaces of the thighs. In size the lesions vary from that of the cross section of a pencil to that of a dime. The lesions are: erythema, visible only in light colored skin; vesicles rarely observed in swine; pustules, that later become umbilicated; and scab formation.

Question: Is it possible for a hog to have cholera without fever?

Answer: All things are said to be possible but in our judgment it is not probable that a hog will have cholera and not fever,

particularly during the early stages of the disease.

Question: Is it possible for hog cholera to occur in sows and not in pigs suckling affected sows?

Answer: Yes, it is possible provided the pigs have an immunity to cholera, but we can not conceive how such pigs would obtain an immunity except from the sows and since the sows have the disease they are not immune, and therefore the pigs could acquire immunity only by vaccination.

Question: Is porcine sarcoptic mange transmissible to animals other than swine?

Answer: The mite may be transmitted to other than swine but such infestation is temporary and is not of significance in the control of sarcoptic mange in hogs.

Question: Does advanced pregnancy or recent parturition influence the agglutination test in sows?

Answer: Yes, the agglutination test in swine corresponds to the same test in cattle. But, porcine brucellosis is generally less difficult to control than Bang's disease.

Question: Should internal parasites be given much consideration when a herd is to be vaccinated against hog cholera by the use of serum and virus?

Answer: Emphatically yes, because parasites diminish resistance and post-vaccination trouble may result. Only healthy swine should be given serum and virus. The parasitic condition should be controlled before using serum and virus.

* * * *

Improper housing is a factor in the loss of young pigs. If pigs are kept on concrete there is a tendency for them to become anemic. When the hog houses are constructed it is advisable to arrange for earth to avoid this type of anemia.

Feedstuff produced during drouths may be deficient in calcium phosphorous and other elements in spite of the fact that the soils may contain ample quantities of these minerals. This is one of the principal problems confronting the breeders in drouth areas. Calcium and phosphorous are necessary in feed of the sow, as well as the pig, to prevent rickets.—*A. T. K.*

Stamina Bred Out of the Modern Hog

A comparison of the modern 1939 model hog and the wild hog, particularly as to their feeding, housing and sanitation, is pertinent. Let us begin with a six-month-old, wild gilt. Early in the morning, this gilt gets out of her bed and starts to drift about looking for food, picking up a nut here, wisp of grass there, and turns over a stone and gets a grub, then meanders down to the brook and gets a drink of clean water. Thus, she travels throughout the day, the distance traveled depending upon the prevalence of food in the vicinity in which she is ranging. This continues until that gilt is from a year to 18 months of age, then she seeks a mate. After breeding, she will proceed with about the same program, caring for herself during the pregnancy period.

Just before farrowing, this gilt will hunt a secluded spot and make herself a farrowing bed. She will not leave her pigs for one or two days after farrowing, then for the next few days she will run out a little distance, obtain a little of something to eat, and then back to the pigs. Her daily ration is cut way down in amount.

The wild gilt does not lose her pigs from scours. She protects them and supplies them a limited amount of milk during the first week after they are farrowed. As time goes on, the pigs develop and travel with their mother in search of food and drink.

Wild pig is forced to exercise to obtain its feed. This exercise developes the thorax thus increasing the resistance to pulmonary disorders. The capacity of the wild hog's digestive organs are relatively large because of the bulky feed consumed.

The rotation of lots (bedding grounds) and pastures (ranges) is a habit of wild hogs. It automatically diminishes parasites.

The modern hog has been so bred that the thoracic cavity has been diminished to a minimum. The digestive tract has been reduced and the laying on of fat so increased that the digestive tube is encroached upon. It is no wonder that such an artificial animal is extremely subject to disease of its pulmonary and digestive

tracts. It is a wonder that so many of them live long enough to reach the market.

Kansas City, Mo. A. T. KINSLEY.

Abortion in Swine

I shall appreciate information relative to an outbreak of abortion in swine. These sows are on a farm where swine erysipelas has previously occurred. All swine were disposed of after the erysipelas outbreak, but it is generally conceded that erysipelas infection persists on a premise for some time, even though all swine had been disposed of and new stock acquired.

Aborption is occurring in gilts at various stages of pregnancy. These gilts are fed and cared for properly. There is no Bang's disease on this farm. One old sow from another source farrowed normally and her pigs are doing fine. The gilts abort from one to four fetuses. Any information will be appreciated.—*C. W. S.*, Nebr.

Comment: Abortion in swine may be due to a variety of causes; probably, the most frequent being the brucella organism. In this type it usually occurs in the latter stage of pregnancy.

Abortion is also prone to occur in sows that have had a febrile disease after having been bred. Thus, abortion may occur in sows as a result of cholera, swine influenza and acute erysipelas. It has also been noted in sows as a result of metritis. Improper breeding practices are potent causes of abortion. The boar may be a factor, particularly in the spread of infection, but is probably not of much importance as a spreader of the *Brucella suis*.

Small litters are frequently associated with excessive service of the boar, particularly in pasture breeding. In this case you may have to contend with both infection and an excessive use of the boar.

It would be advisable to blood test the sows and the boar to ascertain whether or not they are infected with *Br. suis*. This organism can usually be eliminated by three successive blood tests and removal of the reactors. If brucella infection is not present, proper feeding, breeding and management will usually suffice to get the herd in condition for breeding.—*A. T. K.*

Parasitism of Shotes

Fifty pigs, two to six months of age were unthrifty, emaciated, had a rough coat and were not growing or developing as they should.

After administering a vermifuge to the older shotes, there was a marked improvement for a time but later they became unthrifty again and several died.

Icterus and the presence of some round worms and thornheaded worms were noted on autopsy.

Any information you can give me will be appreciated.—*C. L. C.*, N. C.

Comment: Further information should be supplied concerning these pigs, such as the temperature; whether or not there is any scouring or constipation; the appetite, the kind of feed, etc. These are all facts upon which a diagnosis is dependent.

If there were no lesions in the spleen, the icterus was probably due to infection of the liver with parasites.

I am inclined to believe that the unthriftiness of these pigs is primarily of parasitic origin, and suggest the use of the following formula:

℞
Bichloride of mercury
Iron chloride
Copper sulphate .....aa.....℥II
Water .....Cong. I
M.

Sig. Use one tablespoonful above mixture to each gallon of drinking water, or water for soaking feed. Increase the copper sulphate 50% (*i.e.*, use 3 oz.) when coccidia are present.

This formula has been extensively and quite successfully used throughout the Middlewest in herds of swine where there have been microscopic or macroscopic parasites.

Please note this formula can be used in the drinking water or as a soaking medicament for any soaked feeds. The combination should be continued for a week or ten days, and if the shotes have no fever use Fowler's solution, giving about two drams daily to each 100 pounds of swine. This can be given in the slop or feed. Continue the arsenical preparation for four or five days.

If there is any indication of cholera manifested by high temperature, inappetence

and tendency to hide in their beds, then they should be given anti-hog cholera serum. It is not advisable to give hog cholera virus until the parasitic conditions have been corrected.

While it is my judgment that your trouble is due to parasites, one must always be on his guard for infectious diseases such as cholera, erysipelas and paratyphoid infections.—*A. T. K.*

Malignant Edema and Anthrax in Swine

Information on the following swine malady will be appreciated. There was on this farm two old sows and six 100-pound shotes. Three of the shotes have died. The only symptom manifested was swelling in the throat region. On autopsy the pharynx, trachea and esophagus were apparently normal but the intestinal tissue was infiltrated with an edematous fluid. Affected individuals die promptly. Any suggestions will be appreciated.—*C. C. K.*, Kans.

Comment: The condition is apparently an infection, probably malignant edema or anthrax.

Malignant edema is characterized by an edematous swelling, fever and if the swelling is extensive, there may be difficulty in breathing and in swallowing. Awns from barley, wheat, etc., may puncture the mucous membrane in the pharyngeal region and thus introduce the infection. The extravarate in malignant edema usually is admixed with gas, and such lesions have an offensive odor. In anthrax infiltration, there is no gas and no mal-odor.

Anthrax in swine is usually localized in the throat region in the beginning and is characterized by swelling, rise of temperature and difficult respiration. Not all affected swine die of anthrax.

It is not an easy matter to distinguish anthrax and malignant edema in swine. The history of the case will be of some value. Laboratory tests should be resorted to, using all precautions to prevent spread of the infection, and self infection.

Information as to the outcome of this malady will be appreciated.—*A. T. K.*, Mo.

Swine Erysipelas Control by Quarantine

Doctor F. H. Oberg, Corpus Christi, Texas, reports his experience in the control of swine erysipelas in Neuces County, Texas. He says there are approximately 15,000 hogs in Neuces County. Swine erysipelas was identified in this county in 1936. There were some 20 infected herds in the county in March, 1938, when the entire county was quarantined. The general quarantine was lifted on April 20th, and 11 different premises and public stock yards were placed under quarantine. On August 27, 1938, this number was reduced to two infected herds and three infected premises. There has been only one outbreak of swine erysipelas in this county since April 1, 1938.

The death loss of swine due to erysipelas since 1936, approximates 1500 head.

According to Doctor Oberg, the control of swine erysipelas in diseased herds depends on the virulence of the infection, which varies in different herds. In the acute septicemic type of the disease, he has used serum in one and two doses. The second dose of serum is given on the fourth or fifth day in those instances in which the first dose has failed to check the disease. All hogs affected with the chronic form of the disease are destroyed and cremated. The remainder of the herd is fed out and put on the market where Federal inspection is maintained. After all the hogs have been disposed of the premises are cleaned and disinfected and abandoned for swine raising wherever possible.

In a few instances, brood sows have been selected after all symptoms of the disease have been absent in the herd for two months or more. Such brood sows are placed on new premises. Up to this time there has been no recurrence of swine erysipelas, in sows so selected. It is possible, however, that trouble may be encountered later as some of the recovered sows may be erysipelas carriers.

There is apparently no benefit from serum in the treatment of subacute and chronic cases of swine erysipelas. In those herds in which there are many chronic

cases, all unprofitable hogs are destroyed and the remainder finished for market. Several herds have been reëstablished on the same farms by placing them on areas where no hogs have been before. It seems probable that the infection is carried for a longer period in subacute and chronic forms of the disease than in animals that recover from an acute attack.

The control of swine erysipelas would be a much more simple problem if there were a reliable test that would detect infected animals.

The swine erysipelas quarantine of Neuces County, Texas, we believe, is the first area *quarantine* of swine erysipelas in the United States.—*A. T. K.*

Treatment of Rectal Prolapse in Swine

A simple method of treating prolapse of the rectum of swine has been described. The necessary equipment consists of a metal tube one-half to one inch in diameter and two to three inches in length. The common garden hose coupler serves the purpose of the metal tube. Sufficient strong cord for a ligature should be provided In case ordinary metal tubing is used there should be a small band soldered on the outside at each end. The diameter of the tube should be determined by the size of the patient. The operation consists of cleansing the protruding tissues after the patient has been properly confined. Animals that are constipated should be relieved of the condition before the operation. The tube should be inserted about one-half of its length into the rectum while traction is being exerted on the protruded portion, then apply the ligature as taut as possible back near the anus around the prolapsed rectal tissue. If the ligature is sufficiently taut the protruded portion will slough in a few days and the sloughed surface will heal without further attention. In some cases, it may be necessary to tighten the ligature after one to three days. The principal after-treatment consists in providing laxative feed.

Anaplasmosis-like Disease in Swine

An anaplasmosis-like disease has been observed in swine in Illinois, Iowa, South Dakota and Missouri. The symptoms are depression and rise of temperature up to 105° F. There is usually thumps, rapid shrinkage, pallor of the visible mucous membrane followed by icterus and there may or may not be a scurvy-like condition of the skin.

Lesions—Icterus throughout the carcass, anemia, blood thin and liquid. Excess fluid in various body cavities; marked tumefaction in the spleen. This is the type of disease in which there is an enormous, greatly engorged spleen.

This disease is apparently not very prevalent and anaplamosis-like may be a misnomer, but in the red blood cells a coccoid-like body similar to the anaplasma of cattle has been observed. There is no evidence that it is transmissible. The disease is apparently controlled by the use of Fowler's solution or sodium cacodylate. —*A. T. K.*

Pasture breeding is a factor in pig losses. Boars have been observed to make 10 to 15 services a day in pasture breeding. Pasture breeding reduces the virility of pigs and results in small litters, the average being two or three pigs per sow. The average farrow under proper breeding methods is from eight to 12 pigs. The breeding of diseased sows is another factor that contributes to heavy baby pig mortality.

Improper feeding is a factor in the loss of young pigs. An important matter in very young pigs is to reduce the ration of the sow fully 50% a day or two prior to farrowing; and that limited ration should be continued for at least a week or preferably ten days after farrowing. This procedure limits the milk production to an amount the young pig can handle without suffering from digestive disturbances. The pig should not gain in weight from the time of farrowing until it is about ten days of age.—*A. T. K.*

Canine Pediatrics

VIII. Caloric and Fluid Requirements of Young Puppies*

By D. M. CAMPBELL,
Chicago, Illinois

THE optimum caloric and fluid intake for an individual young animal is as specific as are the qualitative and quantitative balances of the components of the dietary. In the feeding of very young puppies, underfeeding and overfeeding are equally to be avoided, for each extreme has its inherent unfavorable results.

Particularly in artificial feeding, where natural limitations of available milk from the bitch are inoperative, it is essential that food ingestion be controlled to assure, on the one hand, proper intake best calculated to provide for growth and body maintenance, and to check, on the other hand, the natural tendency of puppies to eat as much as is offered them or as much as they can engorge.

Borden research workers, in developing a satisfactory simulated bitch's milk and an effective feeding technique sought to answer the question of caloric and fluid intake in the same terms that are applied to artificial feeding of human infants.

The total daily food or energy requirement of a very young growing puppy is best expressed in calories per day for the animal, or per pound of body weight.

THE animal requires energy to supply the heat necessary to maintain body temperature at a level which permits proper speed of chemical processes and which keeps protoplasm in the correct state of viscosity. Additional energy is required to perform the external and internal work involved in all bodily movements, and in such functions as moving the blood and secreting the urine. Energy also is consumed in the synthesis of specific materials within the body.

There is a balance between expenditure and income of energy, and the law of conservation of energy applies to puppies and to human beings as well as to machines. The heat given off by a puppy may be measured by a respiration calorimeter with which it is possible to demonstrate that the amount of heat, whether it be perceptible or the latent heat of vaporization, is equivalent to the amount of heat liberated by the oxidation of carbohydrates, fats and proteins within the body.

The amount of heat produced and the amount of carbon dioxide expired per pound of body weight vary with the different ages of the individual animals, and are proportionately much greater for puppies than for adult dogs. It has been determined by use of the calorimeter that the carbohydrates and the fats can replace each other very largely in body metabolism, and that in the absence of either, required energy may be obtained from the proteins. However, foods are merely the raw materials from which the body is made, and it is generally accepted that the foods themselves oxidize only as they are combined in living protoplasm. Hence, although the caloric value of a food intake may be calculated, the caloric value in itself and alone affords no assurance that heat and energy requirements will be met unless the food is compatible and susceptible of synthesis into body tissues and fluids capable of maintaining normal body functions and permitting of normal oxidation processes.

INTIMATELY coördinated with correct caloric intake in the feeding of young puppies is the fluid requirement. Water, measured in terms of urgency of demand and the prompt disaster which follows failure of supply, is of greater immediate

*Prepared in collaboration with Dr. G. C. Supplee and J. H. LeWare, Borden Research Laboratories, Bainbridge, N. Y. This is the 8th of a series of 12 articles on the feeding of young puppies. The 9th will appear next month.

importance in nutrition than are ordinary foodstuffs, and in this respect is second only to oxygen as an essential for life.

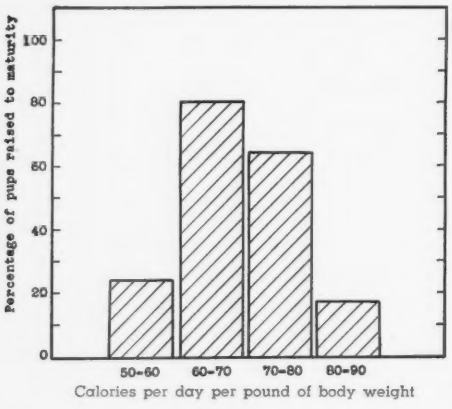

CHART XV

This graph demonstrates the importance of proper control of caloric intake during initial feeding of very young puppies with simulated bitch's milk. Note particularly that the 60 to 80 calorie per day per pound of body weight level, especially the 60 to 70 intake, is markedly superior to the 50 to 60 or the 80 to 90 levels

Water is the most abundant element of the living cell. It serves as a vehicle for body substances and as a solvent for waste matter. Because of its solvent power and because it is a good ionizing medium, water has the property of accelerating most types of chemical reactions.

Water regulates body temperature by stabilizing the heat obtained from the caloric components of the diet. The high specific heat of water is of great biological importance. The fact that more heat is required to raise the temperature of a gram of water one degree than to raise the temperature of a gram of any other known substance one degree makes it of great value to the cells since when heat is liberated in the process of metabolism, the water prevents the temperature of the cells from rising rapidly. In this way water acts as a temperature buffer by taking up liberated heat and giving it off gradually, thereby preventing violent temperature fluctuations.

WITH suitable solid components for a successful simulated bitch's milk determined in accordance with principles outlined in previous articles of this series, and with a realization that it is necessary to accustom the digestive tract of the puppy to any food other than its mother's milk, whether the animal is taken from its mother at birth or whether it is weaned after a period of suckling, experiments were started from known starvation feeding levels and amounts of formulæ were arrived at that proved compatible and at the same time permitted controlled rates of growth and development, during the initial feeding period. After the initial feeding period of about two weeks during which the puppy's system becomes accustomed to the artificial food, the caloric level was gradually increased to permit accelerated growth and development.

Chart XV summarizes the results obtained from experimental feedings of that group of puppies used to determine critically the most appropriate daily caloric intake of simulated bitch's milk for the initial feedings. The chart shows the percentages of the puppies that survived when fed at various caloric levels that proved to be of critical significance, namely, at levels between 50 to 90 calories. The numerous other pups involved in the complete study, wherein the extremes of the caloric levels, both those as low as 20 to 40 and those in excess of 90, up to 120, cannot be entered in this statistical summary usefully because of the high proportion of casualties resulting from inadequate caloric intake on the one hand and from excessive feeding on the other.

It is seen in the graph that as the marginal life-sustaining level of 50 to 60 calories per day per pound of body weight was reached, 23% of the puppies survived

THE narrow line that marks the boundary between inanition and adequate nutrition is indicated strikingly by the sharp increase in the number of puppies that survived when the caloric level was raised to between 60 and 70 calories. In this group 80.5% of the puppies thrived

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and grew to be normal, healthy young dogs.[1]

It is apparent from the graph that the intake level of 60 to 70 calories per pound of body weight represents the optimum mean for adequate nutrition and compatibility during the initial feeding period, for as soon as the caloric intake was increased to higher levels during this period the mortality rates increased.

Coördinating the statistical data with clinical and pathological observations, it may be said that in the 10-50 calorie per pound ranges the puppies died of malnutrition, as evidenced by dehydration and severe loss of weight. As the maximum of 70 calories per pound of body weight is approached in the 50-70 calorie range, the observer notes the trend toward elimination of such pathological conditions, particularly in the range of 60-70 calories where there is a maximum of compatibility of the food and total absence of pathological conditions in the normal puppy, and in all cases adequate growth and development.

THE onset of the adverse effects of overfeeding are noted beginning in the 70-80 calorie range. Within the 80 to 90 calorie range the emphasis of negative results of overfeeding is as striking as was the previously noted favorable contrast manifested when the caloric intake was raised from the 50 to 60 level to 60 to 70 calories. It must be noted here, however, that the graph and the data represented thereby deal only with the initial feeding of very young puppies taken from the bitch at birth and puppies a few days old, weaned abruptly. The plan of this particular experiment did not involve gradual weaning. Notwithstanding these circumstances, after a period of gradual adaptation involving an interval of one or two weeks the caloric intakes were progressively raised, with the puppies ultimately receiving caloric intakes equivalent to that obtained from bitch's milk. The physiological and biological principles involved in this progression are to be expected, because notwithstanding the satisfactory character of the simulated bitch's milk it is not to be presumed that it is the complete biological

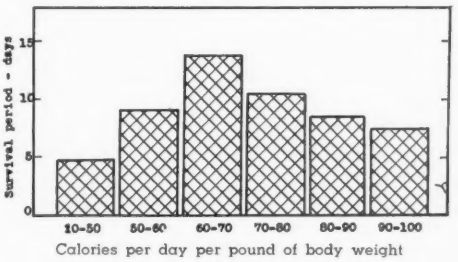


CHART XVI

This chart further illustrates and confirms the more suitable caloric intake for the artificial feeding of young puppies on simulated bitch's milk. It shows the comparative, average, survival periods of dogs which died at various caloric levels

duplication of natural bitch's milk, any more than milk formulas for the artificial feeding of infants fulfill the theoretical ideal of breast milk.

Chart XV deals with the optimum caloric levels of simulated bitch's milk as reflected in the percentages of puppies that were raised successfully. Confirmation of the validity of the conclusions derived from such data is evidenced in a study of statistics concerning the puppies that died of malnutrition or of overfeeding at improper levels. Chart XVI shows these data in graphic form. The average survival period of the puppies that died when fed at levels below 50 calories was only 4.75 days. The survival period of those that died at the marginal level of 50 to 60 calories was 9 days. Those puppies which died at the caloric level of 60 to 70 calories during the initial feeding period survived on an aver-

[1] It should be noted here that in this group of puppies there were some that were at great disadvantage from birth as a result of malnutrition of some of the bitches during the prenatal periods, and, in certain cases, of too quick breeding—which factors combined to produce a number of puppies not in proper wholesome and healthy condition at birth.

age of 13.75 days, the longest period of survival, and one which may be interpreted as confirming the data present in Chart XV.

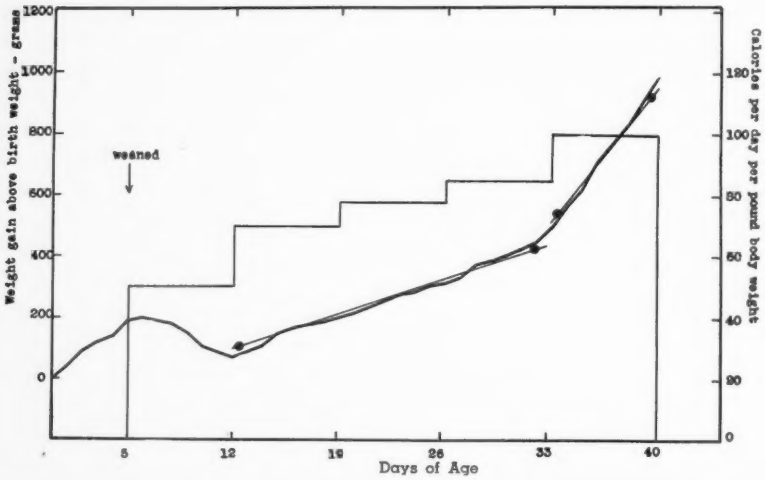


CHART XVII

The growth response of a young puppy to bitch's milk and to feedings of simulated bitch's milk at starvation, marginal, optimal and maximum caloric levels is illustrated in this chart

STUDIES similar in nature to those whereby optimum caloric levels were determined, correlated with the known fluid-solid ratio of natural bitch's milk, prove that the normal fluid requirement of puppies, naturally or artificially fed, ranges from 2½ to 3 ounces per day per pound of body weight. In order to maintain proper fluid intake during initial periods of comparatively low caloric levels, the percentage concentration of the formula is lowered. Since the caloric level increases more rapidly than the fluid requirement, the concentration of the formula becomes increased as the feeding progresses.

When the optimum caloric and fluid levels for artificially-fed puppies had been established by these controlled feeding tests, check observations were made of the normal ingestion of natural bitch's milk by puppies in normal litters. The total daily intake of the puppies was determined by weighing them before and after each suckling period. The caloric value of the bitch's milk was obtained readily by analysis. Thus it was determined that the caloric value of the mother's milk taken by individual puppies ranged from 90 to 130 calories per pound of body weight per day. The figure in any specific case varies with the number of puppies fed by the bitch and with the abundance of milk available from the mother. It was observed that the fluid intake ranged between 2½ to 3 ounces per day

Dr. D. A. Smith, Iowa State College, Ames, demonstrating surgery on the dog at the Illinois Veterinary Conference, Urbana, Oct. 5-7, 1938.

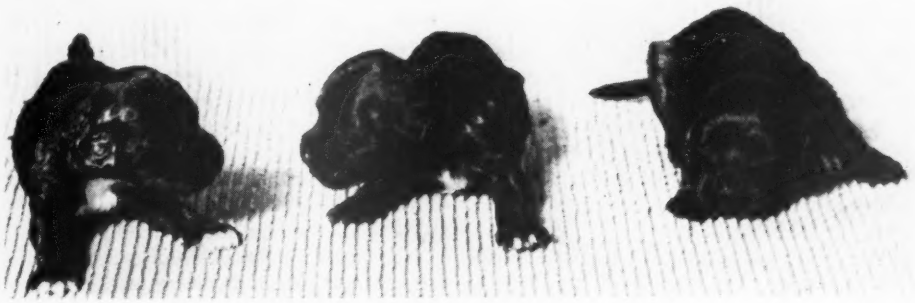
per pound of body weight. These data show a higher average caloric value than the optimum initial caloric intake of the simulated bitch's milk, but as explained previously, controlled increases of caloric intake soon bring the ingestion of simulated bitch's milk to a level where both caloric and fluid intakes and growth response parallel to those characteristic of bitch's milk are attained.

THE case history of a puppy whose feeding regimen took him through the entire feeding range, from a brief suckling period, through starvation, marginal, optimal, and maximum caloric levels of simulated bitch's milk is graphed in Chart XVII.

The puppy was left on the bitch for a few days after birth to establish a normal weight gain rate. Thereafter it was placed on simulated bitch's milk. The intake for the first week on the formula was kept within the starvation range of 50 calories. This caloric level brought an abrupt and fairly severe loss in weight. Undoubtedly, prolongation of this subnormal caloric feeding would have resulted in disaster. The formula, however, was raised to a 60 to 70 calorie level, and the puppy immediately picked up weight. Meanwhile, the animal obviously was developing increased tolerance for the formula. In the fourth week the caloric range was increased to 80-90. Weight continued to increase, and when the caloric intake was increased to a level of 100 in the fifth week, complete tolerance had been established and the puppy responded with an accelerated growth rate and improved health and development.

MORE striking than graphs and statistics as evidence of the optimum nature of any particular feeding method are healthy vigorous puppies. The accompanying illustration is from a photograph of three cocker spaniel puppies taken from their mother at birth and raised on simulated bitch's milk, fed at the controlled caloric intake previously described. The puppies were 18 days old when the picture was taken. Note the vigor, the glossy coats, and the obvious general thrifty condition of these puppies resulting from a suitable formula properly fed.

WITH a simulated bitch's milk of suitable constituents and balance available, and optimum caloric and fluid levels determined, it is essential in the successful artificial feeding of very young puppies that a proper feeding regimen be followed. Detailed information concerning preparation of the simulated bitch's milk formula for feeding puppies of all ages, feeding schedules, and feeding methods will be presented in the next article of this series.



HEALTHY PUPPIES

The puppies in this picture, photographed at 18 days of age, were taken from their mother at birth and fed controlled caloric levels of simulated bitch's milk. The sturdy, vigorous condition of the puppies typifies what may be accomplished with a satisfactory simulated bitch's milk fed at appropriate, regimented levels.

Legal Liability for Dog-Bites

By LEO T. PARKER, Cincinnati, Ohio

MANY persons entertain the belief that all dogs are entitled to "one bite" before the owner can be held liable in damages for injury caused by the dog. However, this is not true if, for instance, the owner knew that the dog was vicious. Some states have enacted laws which clearly specify the liability of owners for injuries caused by their dogs. A few of these state laws provide that the one who harbors the dog, also, is liable, even though the dog does not belong to him.

State Laws Vary

A state law is void which makes the owners of dogs liable for all kinds of injuries.

For illustration, in Goodwin v. Giovenelli, 167 A 87, it was disclosed a state law made the owner or keeper liable, under all circumstances, for all damage done by the dog to the body or property of any person. The higher court held that, under this law, a dog owner is not liable for damages when the dog bites a person at a time (1) when the dog was protecting the master's premises; or (2) when the injured party had provoked the dog by conduct which he knew or should have known, was calculated to arouse him to attack.

The Common Law

Let us review the common established law in states and cities which have no statutes intended to hold dog owners and harborers liable in damages for bites. In these localities, the common law expects dog owners to use ordinary care to protect all persons against injuries effected by their dogs. The term "ordinary care" is used in practically all higher court decisions involving injuries caused by dogs. Therefore, it is well to know the legal meaning of this term.

The courts have held that a dog owner uses ordinary care to prevent his dog injuring persons when he uses that *same* degree of care that would have been used by other careful dog owners under the identical circumstances of the injury. For example, the majority of dog owners, who have average prudence, do not permit a dog to run out of a yard and bark at persons who pass by. If the owner of a dog does not attempt to call his dog back from a person at whom the dog is barking, when off the owner's premises, and that dog bites a person who is passing by, then the owner would be held liable in damages for an injury that the dog may effect.

On the other hand, suppose that a person who is soliciting sales for merchandise comes into the yard or onto the premises of the owner of a dog. The dog barks at the solicitor, and the owner does not call off the dog, which soon afterward bites the solicitor. This is a different situation. In this case, the average prudent and careful owner would believe that his dog has a right to bark at intruders, and in fact a watchdog punished for barking at persons who trespass on the premises probably would be ruined as a watchdog. Therefore, if the dog has not previously bitten anyone, and is not known to be vicious, the owner would not be liable in damages, because he used the same degree of care to protect the solicitor from injury as would have been used by the average, prudent dog owner under the same circumstances.

If, on the contrary, this dog had previously bitten others, and the owner knew that it was vicious, a different situation arises. The chances are that the higher court would hold the dog owner liable in damages, because the evidence would prove that he did not use ordinary care, since the average dog owner with reasonable prudence and consideration would have called the dog off from the solicitor, knowing that he was likely to be bitten.

The law is well established that the owner of a vicious dog is on the same legal plane as the owner or keeper of any other thing known to be dangerous. This law is applicable in localities where there is no state statute or city ordinance making those who

harbor dogs liable in damages for any and all injuries that the dog may effect.

Watchdog Law

Various courts have held that where watchdogs are kept for protection, the dangerous character and knowledge of such dogs may be inferred from their size, their actual conduct, the admitted purpose for which they are kept, and the care exercised in their custody. In other words, the owner of a watchdog usually is liable in damages for injuries caused by such dog if he permits it to run loose and it attacks anyone who is *rightfully* on the property.

For example, in Gerulis v. Lunecki, 1 N. E. (2d) 440, it was disclosed that a woman visited on property whose owner had a vicious watchdog. This dog had been chained to a post attached to a garage. The chain, approximately five feet in length, was attached to the collar around the dog's neck, and the dog was usually kept within a wire inclosure about five feet high. One day the owner let the dog loose and he attacked the visitor.

The court promptly held the dog owner liable for $2,500 damages, saying:

> It is evident that this police dog was kept by the defendant for the purpose of protecting his property against thieves and intruders. While there is no evidence that he was kept in an inclosure, nevertheless on the day on which this injury occurred the plaintiff (woman) was attacked and the defendant was properly chargeable with the dangerous character of the dog and knowledge thereof.

Not One Bite

Some courts hold that a dog has "one bite," before its owner can be held liable in damages. However, this is not universal law.

For example, in Mailhot v. Crowe 170, Pac. 131, it was disclosed that a woman peddler was attacked by a dog suddenly and without notice, warning, or provocation, thrown down, and severely bruised and contused on her stomach, breast, side, and hips, from which she suffered great pain.

Although this dog never before had bitten anyone, there was evidence of several specific prior instances when the dog without provocation had run after passers-by, growling in a threatening manner. In two instances at least members of the owner's family had interfered by catching the dog by the collar or chain and restraining him. There was also evidence that the animal had the reputation in the neighborhood of being vicious and dangerous, so much so that some of the neighbors habitually used other streets in order to avoid passing the premises where he was harbored.

Therefore, the higher court held the dog owner liable, saying:

> It is true that so far as the evidence shows the dog had never actually bitten anyone, but it is well established law in this state, in common with many others, that the keeper of a vicious dog is bound to observe other manifestations of ferocity short of actual injury, and is not justified in neglecting to keep him in restraint until he has effectually mangled or killed at least one person.

Is every dog entitled to one bite? Attorney Parker says that one can't always rely on this ancient adage, and explains how the laws covering the liability of dog-owners vary in different localities.

Vicious Dog

Various courts have held that it is not necessary to prove positively that the owner knew that his dog was vicious. In other words, if the circumstances indicate that the owner should have known that the dog was vicious, he is liable.

For example, in Perazzo v. Ortega 256 Pac. 504, it was shown that a person was riding west on a public highway upon his bicycle, when a vicious black dog ran from under the fence of the yard and attacked and bit and threw him from his bicycle with such force and violence as to fracture his left arm. He sued the owner of the dog for damages.

During the trial the owner contended that he did not know that the dog was vicious. However, one witness testified that a girl had climbed a tree to prevent the dog from biting her while walking on the highway. Another person testified that: "The dog would run at me when I would have business on the north side of the canal. With reference to this black dog, my experiences have been varied. * * * The dog would generally meet at the corner. He would run a bluff; then I would run a bluff. The dog would try to scare me, then I would try to scare the dog. Rocks and a club were the means I took to scare the dog. I didn't take any foolish chances."

Still another witness testified that a number of times this black dog came out as he went by and wanted to bite him; that he threw rocks at the dog and on one occasion went down the canal 200 yards and crossed on a cable, because the dog met him at the bridge and he had nothing with which to defend himself. In view of this testimony the higher court held the dog owner liable for a large amount in damages, and said:

In the light of the foregoing the jury was clearly justified in finding that Perazzo had knowledge of the dog's vicious disposition.

Although the owner testifies that he did not know that his dog was vicious, if it is shown in the suit that other members of the owner's family knew that the dog was dangerous, he is liable.

In R. C. L. Vol. 1, p. 1118, this language appears:

Where one keeps on his premises a dog which has attacked or bitten a considerable number of persons, and is notoriously cross and vicious, it may be presumed that the owner has some knowledge of this fact.

Owner Knows Dog Is Vicious

Assume that a property owner ties his dog in a rear yard, and he well knows that this dog is vicious; in fact, that it already has bitten many persons. Under these circumstances, if a person who is a trespasser comes onto the property and gets bitten the owner is not liable, unless the testimony proves that the owner knew that the person who was bitten intended to come onto the property. Under the latter circumstances, the law expects the owner to notify such person that the dog is vicious, and if he fails to do so, and the dog bites this person, he is, although a trespasser, entitled to recover damages.

In other words, the courts consistently hold that any person who owns and harbors a dog known to be vicious, is bound to exert care to prevent the dog from biting anyone, including those who may come onto the property without legal right, but with notice to the owner.

Now, let us assume that a property owner, knowing that his dog is vicious, fails to tie him up, or to otherwise confine him. A person comes onto the property legally and without notice to the owner of the dog. This person may be any delivery person; a gas, electric or water meter reader; a state, county or city inspector; or any other person who has a right to come onto the premises for any legal purpose. There is no doubt but that the owner of the dog is liable in damages, if such a person is bitten. The law is applicable even though the owner did not know that the person intended to come onto the premises, because the important legal point is: The person was not a trespasser. The law considers a vicious dog as a dangerous condition existing on the premises, and the owner must use ordinary care to safeguard persons against injuries. For instance, in one case the court held a property owner liable in damages for an injury to a person who was bitten by a vicious dog, where the

testimony proved that after the dog had bitten two other persons, the owner put a home-made muzzle on him, which the dog, without difficulty, pulled off. This court explained that a vicious dog is nothing more or less than a dangerous condition existing on the premises, and that the owner must use the same degree of care to protect persons against injury from the dog, as would be required with respect to all other dangerous things and conditions.

This court went so far as to explain that if a property owner knows that there exists on his premises a dangerous sink hole, the property owner is not obligated to post a sign to notify *all* persons of the dangerous conditions, but he is obligated to inform all persons, either by written, verbal or conspicuous sign warnings, of the location of the sink hole; otherwise he is liable in damages for any and all injuries that may be sustained by any person who has a legal right to come onto the premises.

On the other hand, it is interesting to note that this court explained further that the property owner would not be liable for an injury to a trespasser, if such trespasser did not in some manner notify the property owner that he intended to come onto the premises, and the dog owner did not have an opportunity to prevent the injury.

Damages Allowable

While considering the subject let us review several higher court cases in which owners have been held liable in damages for dog bites.

In one case, 256 Pac. 503, the court held a dog owner liable for $5,000 damages. The evidence showed that the injured man was 27 years old, and that his arm was broken near the elbow in two places, and his thigh bitten by the dog. He spent 11 days in the hospital, and was subsequently treated for 18 months by a physician. He was unable to do his regular work, and spent $800.00 for doctor fees.

In another case, 266 Ill. App. 466, it was disclosed that a girl five years of age was severely bitten by a pack of dogs, there being between 250 and 300 lacerations in various parts of the body, leaving about 75 permanent scars on the body and permanent nervousness. The court allowed $3,500.00 damages.

In still another case (320 Mo. 1011), the court allowed $16,000 damages to a truck driver, earning $25.00 per week, and 26 years old, at the time of injury. He had a skull fracture, severe concussion of the brain, with resultant mental and muscular incoördination and loss of memory, paralysis of eye muscles, double vision, sick headaches, extreme nervousness and irritability. In fact, his condition after being injured was such that he was unable to do any work.

On the other hand, in another case (127 So. 413) the higher court refused to uphold the lower court's verdict allowing $318.00 damages, and reduced it to $218.00, where it was shown that the woman had no serious resulting injuries; she was unemployed at the time, and the jury allowed $200.00 for pain and shock and fright; $100.00 for loss of wages, and $18.00 physician's bill.

In this case it was disclosed that the dog involved was of the breed known as police dog which, according to some of the testimony in the record, was usually bad tempered and, at the particular time that the person was bitten, was nursing a litter of pups, a circumstance which is said to have aggravated its unpleasant disposition.

The dog's owner kept a small store and soft drink stand, and a customer was bitten as she went into the dining room which adjoined the store. The dog and puppies were kept under the dinner table. The dog's owner attributed the injury solely to the dog's mistaken belief that some danger threatened its puppies. In view of this testimony the court indicated that the dog owner was liable, saying:

> This explanation of defendant (owner) involves an admission that the dog was unusually irritable at the time plaintiff was bitten and convicts him of negligence in permitting the dog to roam about his store exposing prospective purchasers to the danger of being bitten.
>
> Our conclusion is that the defendant is liable.

Abstracts

B_1-Avitaminosis in Dogs

Unaccountable disturbances in two adult dogs that had always been healthy are recorded.[1] The main symptoms in the one were roughness of the coat, cutaneous edema, muscular tenderness, especially in the neck region, ataxia and periodical inability to stand; and the other dog showed, in addition, edema of the legs, paresis of the left fore-leg, and turning movements to the right. Comparison of the findings with those of beriberi in man led Carlstrom to suggest B_1-avitaminosis.

Both cases quickly responded to vitamin B_1 treatment (intravenous or subcutaneous injections of 2-5mg of "aneurin"). Complete recovery was observed after a daily supplement of 10gm of brewer's dried yeast to the normal ration.

* * * *

A New Antidote for Poisoning

Since the heavy metals are precipitated as the insoluble sulphides by sulphureted hydrogen, the author has prepared a solution of H_2S for use in cases of poisoning by these substances.[2] The method of preparation is as follows: Two grams of pure caustic soda are dissolved in a litre of boiling distilled water and when cool the solution is saturated with H_2S; 7.5 gm. of crystalline magnesium sulphate and 2.5 gm. of pure sodium bicarbonate are dissolved in another litre of distilled water at 50°C. The two solutions are cooled to 0° C., mixed and again saturated with H_2S. The antidote is then ready for use.

When taken in 100cc dose per os, the antidote was found to produce no ill effects but it cannot be given intravenously. In order to test its efficacy the author himself took 0.2 gm. of corrosive sublimate in water—approximately ten times the lethal dose for a man—and a few minutes later took 50cc of the antidote. Apart from a burning sensation in the mouth and pharynx no ill effects were experienced.—*J. A. N.*

* * * *

Nutritional Disease of Mink and Fox

The authors[3] describe a condition frequently occurring in mink, when it is known as "acidosis," and also observed in foxes. The chief symptoms are emaciation, unsteadiness, convulsions, polyuria, and acetonuria, rapidly followed by death. They suggest lack of vitamin B_1 in the ration as the cause, since the condition closely resembles B_1-avitaminosis as produced in experimental rats.

On a silver fox ranch, where the food was found deficient in vitamin B_1, 15 foxes in succession were reported to have become affected with disturbances of this kind. Twelve were already dead, but one of those still alive was successfully treated with a synthetic vitamin B_1 preparation (two injections of 1mg of "aneurin" given intravenously). A supplemental ration of 10gm brewers' dried yeast daily for each animal in the rest of the stock prevented any further cases.

A few cases of acetonemia and of the Swedish form of "pining" in cattle were also successfully treated with vitamin B_1, either synthetic or in the form of brewers' dried yeast. The authors consider that this treatment is rational; it is to be made the subject of further trials.—*Gustav Naerland,* Oslo.

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Vaccination Against Anthrax

Pasteur's classical method of anthrax vaccination has not escaped criticism, and in order to improve upon it, the authors[4] tried various modifications which had been successfully applied in the preparation of other vaccines. Finally, they found that by

[1] Carlstrom, B., 1938. Beriberi hos hund (Beriberi in Dogs); *Skand. Vet-Tidskr,* 29, pp. 218-24. Abst in *Vet. Bul.,* 8.10, p. 655.

[2] Strzyzowski, C., 1936. A new antidote for Poisoning with Heavy Metals and Certain Metaloids. *Presse Med.* 44; 780-783. Abst. in *Vet. Rec.* 50:6; p. 149.

[3] Carlstrom, B., and G. Jonsson, 1938. Ataxi, konvulsioner och acetonemi i samband med B_1-abitaminosis (Ataxis, Convulsions and Acetonemia in Avitaminosis B_1): *Svensk Vet. Tidskr.,* 43: pp. 94-97. Abst. in *Vet. Bul.,* 8:10, p. 655.

[4] Ramon, G., and A. Staub, 1937. A propos de la vaccination charbonneuse. Sur une nouvelle méthode de vaccination des animaux domestiques contre le charbon (A New Method of Vaccination of Domestic Animals against Anthrax). *Bul. Acad. Méd. Paris,* 117, pp. 299-310. Abst. in *Vet. Bul.,* 8:11.

incorporating a suspension of anthrax spores, corresponding in attenuation to Pasteur's first vaccine, in 0.2% agar and 0.33% alum, a very efficient vaccine could be prepared. Sheep injected subcutaneously with a single dose of 0.25cc developed an immunity as early as the fifth day, and this afforded protection for at least eight months. Lanolin was also tried as an excipient, but although an efficient immunity developed, it was not convenient in practice.—*Gwilym O. Davies.*

* * * *

Rats as Carriers of Brucellosis

The course of the disease was shown to be mild[5]. Experimental infection with *Br. abortus* culture fed in milk and also injected subcutaneously or into the conjunctiva, or by scarification, gave rise to positive agglutination reactions from 1 : 25 to 1 : 1000. Application of infective material to intact skin and contact of test animals with infected rats gave negative results.

Br. abortus was grown from the liver and spleen of an infected rat and used orally for test infection of cats, the author mentioning that little is known of brucellosis in the latter animals. Agglutination reactions were positive, but a bacteriological test post-mortem was negative.

Rats found in the vicinity of cattle susceptible to the disease should be exterminated.

* * * *

Lesions and Odor of Hog Cholera

The lesions found in pigs used for the production of hog cholera virus are described.[6] The lymph nodes seem to be always affected; the kidneys, spleen, skin and musculature frequently contain lesions; the spleen and heart are sometimes affected, but the lungs are healthy. The flesh from such pigs has a characteristic odor. The intensity of both the lesions and the odor seems to be proportional to the intensity of the infection.—*B. Oswald.*

[5] Gromyko, A. I., 1937. O brucelle ze seryh krys (Brucellosis of Grey Rats). *Sovyet. Vet.* 8: pp. 717-73. Abst. in *Vet. Bul.*, 8:11.

[6] Debelić, S., 1938. Patološko-anatomske promjene i strani miris u mesu virus-svinja (Lesions and Odor of the Flesh of Pigs with Swine Fever). *Vet. Archiv.*, 8: pp. 1-12. Abst. in *Vet. Bul.*, 8:11, p. 703.

Simultaneous Inoculation Against Hog Cholera and Swine Erysipelas

The author[7] observed that the immunity against hog cholera conferred by serum-virus simultaneous inoculation can be increased considerably by a virus injection three weeks later. Pigs so treated resisted infection with 0.5cc of virus carried out one year later, but four pregnant sows which had been immunized and reinfected in this way aborted, although they did not develop hog cholera, and some others which farrowed at full term produced litters in which 80% were dead. The author obtained good results by adding swine erysipelas antiserum to hog cholera antiserum when immunizing pigs by serum-virus in districts where both diseases were prevalent.—*G. Salyi.*

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Delousing Horses

The following mixture was used with success to free 133 army horses from lice:—2.5gm nicotine (96%), 100gm acetic acid (8-12%) and one litre of water.[8] One careful application was found to be effective in destroying all the lice and eggs, though a repeated treatment may be necessary in some cases.—*G. S.*

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Climatopathology in Veterinary Medicine

The climate can affect the health of animals both directly and indirectly.[9] In the first category are such conditions as phototraumatism and photosensitization, whilst in verminous diseases the climate and season indirectly are of paramount importance; this also applies to diseases which require a vector such as theileriasis.

Anthrax is a more dangerous scourge where the climate permits the organism to

[7] Czilágyi, K., 1937. A sertéespestis elleni szimultán cltáassal kapesolatban tett megfigyeléseim (Serum-Virus Inoculation against Swine Fever). *Allatorv. Lapok.* 60; pp. 323f. Abst. in *Vet. Bul.*, 8:11, p. 703.

[8] Szücs, G., and G. Balás, 1937. Ujabb aljárás lovak tetvességének gyógykezelésére (The Delousing of Horses). *Allatorv. Lapok.*, 60: pp. 321f. Abst. in *Vet. Bul.*, 8:11, p. 707.

[9] Velu, H., 1938. Simple essai sur la climatopathologie vétérinaire marocaine (Veterinary Climatopathology in Morocco). *Maroc Méd.*, 18: pp. 3-13. Abst. in *Vet. Bul.*, 8:11, p. 713.

lead a saprophytic existence. A form of chronic eczema occurring locally in Morocco in equidæ is probably due to climatic causes. An iridocyclo-choroiditis is found only in the Sebou valley, and this may be due to electrical phenomena in that area.

Other diseases in Morocco such as avian pasteurellosis, equine infectious anemia, and Preisz-Nocard infection are associated with seasonal changes and have a definite, limited geographical distribution.

The fact that foot-and-mouth disease, tetanus, and other diseases take a milder form in Morocco than in France is probably due to the differences in the climates of the two countries.

The veterinarian's problem in Morocco is closely connected with the climate; infections frequently follow the results of feeding trouble caused by desiccation of the pastures.—*H. S. Purchase*

Scurvy in Swine

Six pigs over eight weeks old from the same litter were fed for 92 days on food which had been boiled for one hour in order to destroy its vitamin content.[10] At the end of that time four of them were infected with swine erysipelas and two with hog cholera, to find out whether these diseases would aggravate the avitaminotic state and produce clinical scurvy. At the same time five other pigs from the same litter which had been receiving ordinary food containing vitamin C were also infected with swine erysipelas or hog cholera. All the animals were killed at the height of the respective infections, and it was found that the test piglets showed definite signs of scurvy, whilst the controls, of course, showed no signs of it.

After this experiment all young pigs sent to the laboratory for routine diagnostic examination were examined for scurvy by the author and in 25 out of 196 (12.7%) scurvy was diagnosed, while in a further 26 cases there was a suspicion of the disease. In four of the animals with scurvy, purpura was also observed.—*G. Hartmann.*

[10] Michalka, J., 1937. C-Avitaminose (Skorbut) beim Schwein (Scurvy in Swine). *Wien. Tierärztl. Mschr.*, 24: pp. 577-590. Abst. in *Vet. Bul.*, 8:11, p. 725.

Nature the Champion Killer

Nature breeds life abundantly and destroys life remorselessly. Out of a sunlit sky a winged death falls like an arrow on its prey, and through the darkness death flits on silent pinions. From the branches of trees a furry death drops with tooth and claw, and among the grasses a scaly death with poisoned fang winds its serpentine way. Under the waters glides a finny death and in the depths gay-colored death awaits with armed tentacles the life on which it feeds. Out of the North death strikes with cold blizzards and out of the South it rides the hurricane. From the storm clouds death sends its lightning, and from the sun issues death by heat stroke. With famine and thirst death reaps the harvest of life, and in the food she tenders to life lies death in poison, toxin and unbalanced and deficient nourishment. These are the clubs with which nature beats down life spectacularly.

More insidious and less spectacular, as a rule, are the weapons with which nature most often destroys the life she breeds. Death lurks in crawling ticks and mites and rides the air in mosquitoes and flies. It steals into its victims in worms that drain their life blood and sap their vitality. In protozoan parasites it enters the blood stream or invades the tissues. It resides in bacteria too small to see except with the microscope, and lies concealed in viruses that defy the microscope to detect them and the filter to stop them. And if these fail, an inevitable death walks hand in hand with an unavoidable old age.

These deaths stalk among the farmer's herds and flocks and take their yearly toll by hundreds of thousands. They filch from the farmer millions of dollars. And where death's weapons are too dull to kill, they leave their mark in unthriftiness and illness for which the animals pay in suffering and the farmer pays in lost income and costs of feed and treatment. To protect his animals from death and disease the farmer must throw around them as many safeguards as possible. They must be protected against inclement weather, predatory animals, famine and bad feed, thirst and bad water, and against disease.—*Maurice C. Hall.*

Book Reviews

A TEXTBOOK OF BIOCHEMISTRY for Students of Medicine and Science. *By A. T. Cameron,* M.A., D.Sc., F.I.C., F.R.S.C., Professor of Biochemistry, Faculty of Medicine, University of Manitoba; Biochemist, Winnipeg General Hospital, Winnipeg, Manitoba, Canada. Fifth edition. Cloth bound. 414 pages, illustrated. The MacMillan Co., New York, 1938. $4.00.

The welcome this work has received in its field is in a measure indicated by the fact that it has gone to five editions and three reprints in 10 years, and has been translated into and published in Spanish and Chinese.

This text deals with what in a more elementary form veterinarians have studied as students in their course on physiology. It brings this subject in which there has been much progress, since most of us were in school, right down to date and is a welcome aid to a better understanding of the scientific literature of the present.

"Since all living processes are carried on by chemical compounds and ions, both in health and disease, it is obvious that if we can obtain complete knowledge concerning these, and how they behave in normal living processes, and what changes in their behavior in diseased processes, then we shall be much nearer control or prevention of these changes: in other words, we shall be much more successful in curing or in palliating disease."

This text, of course, discusses physiological processes, digestion, metabolism, reproduction, matter and energy, catalysts, hydrogen-ion concentration, *p*H values, buffers, enzymes, hormones, vitamins, the metabolism of proteins, carbohydrates and fats, metabolic processes, milk and other secretions and excretions, osmosis, oxidation, caloric requirements, etc.

The chapter headings include: Introduction; Physical Chemical Concepts of Importance in Biochemistry; Biochemical Agencies—Enzymes, Hormones, Vitamins; Carbohydrates and Related Compounds; The Lipides and Related Compounds; The Proteins and Their Derivatives; The Nucleic Acids and Their Derivatives; Mineral Elements, Water, Alcohol; The Body Fluids; The Body Tissues; Extracellular Respiration; Intracellular Respiration; Bacterial Actions and Detoxication Mechanisms; The Chemistry of the Excreta; Autolysis, Intracellular Enzymes and Enzymic Synthesis; Quantitative Metabolism; Diet; A Biochemical Introduction to Pharmacology; Immunochemistry and the Chemistry of Filterable Viruses.

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THE SOCIAL LIFE OF ANIMALS. *By W. C. Allee,* Professor of Zoölogy, University of Chicago. Cloth bound. 293 pages. W. W. Norton & Co., Inc., New York, 1938. $3.00.

For more than 30 years, the author, aided by his students, collaborators, and independent investigators, has been exploring the group action of animals. This book is an outgrowth of a series of lectures given by the author at Northwestern University. Its parts nevertheless are closely interwoven, and the subject-matter is related without a trace of technical obscurity by a scholar who regards modern science as "glorified common sense."

Responses that differ from those that would be made if the animals were alone are regarded as social in Professor Allee's fundamental definition. Since no one has demonstrated the existence of truly asocial animals, the lower limits of social living cannot yet be defined. Evidence exists, however, to suggest a substratum of social tendencies throughout the animal kingdom. Few readers will need more than a reminder that the elaboration of the caste system of social organization with its fixed division of labor, is more consistently developed among ants, termites, and bees than in man himself.

Massed cold-blooded animals are harder to kill by temperature changes than are similar forms when isolated. If one or a very few pathogenic bacteria gain access to the human body, they are likely to be destroyed, but 30 bacteria, to choose a specific number, exhibit the "communal effect" and may prove at least 200 times as effective as a single member of their kind. Such phenomena represent the earliest beginnings of social advantage.

Wild animals do not need to be killed off to the last individual in order to reach the irreversible path toward extinction. On the contrary, when the numbers of such populations are reduced to a point which may still seem to be large, they die out regardless of subsequent circumstances.

The curious benefit of social life is seen in the ant. Individuals working alone do not accomplish the same amount of work in a given time as they do when working collectively. A Chinese biologist demonstrated that the reaction time of an individual insect may be either retarded or speeded up according as to whether it is placed with an innately more active or more passive insect.

Professor Allee analyzes the so-called "peck order" in chickens. "Putting the matter somewhat facetiously, chickens appear to have developed the sort of line organization characteristic of a military system or a fascist state, while pigeons, together with the ring doves, canaries, and parakeets, are more domestic."—*H. J. Mostyn.*

Kansas City's Super-Men

Harold H. Porter, former city milk inspector, and Steve Ghiggeri, former airport station master, have switched their municipal jobs. Effective immediately, Porter is the new airport station master, while Ghiggeri is the new inspector of milk.—*Kansas City* (Mo.) *Times*, Nov. 7, 1938.

Joseph Freeman's Super-Horse

Midnight Star, perhaps the speediest five-gaited horse in the world, triumphed over his closest competitor, Lady Jane, at the St. Louis National Horse Show Oct. 2-8, 1938. The black gelding continued his triumphal march through the United States horse show rings at Kansas City when for the second time in three years he won the $3,000 American Royal Horse Show championship stake for five-gaited saddle horses before a shouting crowd of 12,000. Winner also of the $10,000 stake at Louisville, Midnight Star sold as a colt for $250 to H. K. Vaughn, Lawrenceburg, Ky., who, in turn, sold him to Frank Heathman for the Leisure Hour stables of Joseph Freeman, San Antonio, Texas. Freeman turned down $25,000 for the horse just before the Louisville show. —*The National Horseman*

Methods of Control of Infectious Diseases

In the prophylactic control of infectious diseases two reactions of the host are taken into consideration; First, the immunity response either to specific antigens, that is, active immunity, or to a lesser extent to serum of animals so immunized, passive immunity; and, second, the reaction to empirical procedures to increase the host's natural resistancce. In the former, vaccination procedures for the prevention of infectious diseases are developments from the observations of Jenner, Pasteur, and other early workers in this field of bacteriology. Although the original concept of the mechanism of active immunity was production of a mild form of disease, such that resistance of the host was increased, this concept is being modified as a result of recent advances in our knowledge of antigens. Methods for the stimulation of active immunity have been of great prophylactic value in those diseases in which the immunity so induced is of long duration, as in smallpox, diphtheria, and tetanus, and, by repeated vaccination, also in those in which the immunity is of short duration, as in typhoid fever. Almost indiscriminately, immunization with specific antigens is the one method which has been widely employed for the prevention of all infectious diseases caused either by bacteria or by viruses, with results both uncertain and perhaps injurious, owing to incomplete knowledge of all factors involved.

In addition to specifically induced immunity, natural resistance of the host obviously plays an important role in the control of infectious diseases. This resistance varies in different individuals.

"Excerpt from "Response in Human Beings to Antigenic Pneumococcus Polysaccharides, Types I and II", by Lloyd D. Felton, Senior Surgeon, U. S. Public Health Service, *Public Health Reports*, 53:42, p. 1855.